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Environmental Governance in Indonesia

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Foreword: Finding Environmental Governance in Indonesia

Indonesia faces a tremendous challenge in managing its environment, especially in terms of balancing its development and sustainability agenda. In the contemporary development approaches, it is commonly found in developing countries that rely on intense pressures on land and natural resources, where increasing per-capita income (PCI) is compensated by the depletion of natural resources and environmental degradation. Following this approach, after achieving a certain level of human welfare, a turning point will occur whereby the levels of welfare will encourage more discussion, interests, and policies implemented by governing actors and sectors toward sustainability. Environmental degradation thus decreases along with increasing PCI (Nurrochmat et al., 2022).[1] To realize this scenario, however, good governance is needed.

Good governance is not a linear sum but a result of clean, democratic, and effective governance (Nurrochmat et al., 2016).[2] In addition to clean and democratic governance, effective governance ensures timely and strategic efforts to reverse negative environmental trends and anticipate irreversible damages and impacts. Indonesia has been actively participating in the global environmental governance arena, strengthening its position and commitment, and sharing its contributions to tackling environmental problems. The current governance systems, including agencies and institutions, policy instruments, actions, and implementation, have been in place to deal with environmental issues in the country. The Ministry of Environment and Forestry of the Republic of Indonesia has been on the frontline leading the environmental governance effort at the national level. However, the governance system in Indonesia is changing toward a more decentralized system which poses both challenges and opportunities at the same time.

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[1] Nurrochmat, D.R., Sahide, M.A.K and Fisher, M.R. (2022). Making Sustainable Forest Development Work: Formulating an Idea for a More Appropriate Green Policy Paradigm. *J. Frontiers in Environmental Science*. April, 25th, 2022. https://doi.org/10.3389/fenvs.2022.783718

[2] Nurrochmat, D.R., Darusman, D.R., and Ekayani, M. (2016). *Kebijakan Pembangunan Kehutanan dan Lingkungan: Teori dan Implementasi* (Forest and Environment Development Policy: Theory and Implementation). IPB Press: Bogor. ISBN: 978-979-493-898-0.

Furthermore, contentious politics play at the core of environmental governance problems in Indonesia. The recent adoption of the omnibus bill perfectly illustrates this dilemma. Another important normative issue worth discussing concerning environmental governance in Indonesia is equity and justice. How can Indonesia provide and protect its diverse citizen and environment, especially the marginalized ones, including the poor, women, and the indigenous people, while continuing its agenda to develop its economy, expand its cities and industries, and boost innovation and sustainability?

This book presents the state-of-the-art environmental governance research and practices in Indonesia. It is a collaborative effort between Indonesian authors and international communities concerned about environmental governance issues in Indonesia. This book discusses the *pluriverse* of the Anthropocene toward an ontological politics of environmental governance in Indonesia and an idea of increasing prominence in the Anthropocene discourses. The discourse draws from the literature on the *pluriverse* and studies of indigenous worlds that have appeared in the past decade, highlighting, in particular, the ethical motivation that underpins calls to recognize different kinds of worlds. It considers the implications of the *pluriverse* in Indonesia, particularly concerning "*adat* revivalism" and Corporate Social Responsibility (CSR) practices.

This book's initial investigation of Indonesia's earth system governance (ESG) notes a paradigm that warrants the broader context of the Anthropocene and human-induced transformations of the entire earth system. The position of climate actions amidst the COVID-19 pandemic from a crisis management governance perspective is also discussed. Addressing climate change cannot be separated from economic and political issues, leading to an emergence of global discourses about the appropriate means for a sustainable transformation. Promoting a circular economy would accelerate the government's commitment to low-carbon development in potential opportunities. Moreover, optimizing blended finance to mobilize public and philanthropic funds can support green movements, aligning with the proliferation of green financial markets.

Evaluating the role of local resource governance in supporting local innovations and strategies for adaptation is crucial, for example, the local governance characteristics and interactions influencing climate change adaptation in an archipelagic nation. Many cities in Indonesia are vulnerable to disasters caused by climate change, mainly prolonged dry seasons, strong winds, and increasing greenhouse gas emissions. These disasters will significantly affect all aspects of life, such as ecosystems, properties, and infrastructures. The vulnerability of communities will also continue to be worsened by increasing urbanization. This will create additional risks for many people. The climate risk and sustainable climate mitigation strategy must be managed and evaluated simultaneously. Furthermore, it is also vital to discuss the role of civil society in shaping urban environmental governance. The revival of the civil society movement was triggered by the fall of communism in the east-bloc countries, the so-called third-wave democracy in many developing countries, and the notion of reinventing the government's role in the west. It demonstrated that civil society movements are not a single homogenous entity. The dissemination of

power among governmental structures was not merely a technical matter aiming to provide a better service but also a notion of political power contestation. The dynamic relationships within civil society organizations, the multilevel governmental institutions, and the various stakeholders in the private sector have led to a mode of governance that cannot be designed to achieve a common goal.

Another important theme is water governance. Water governance in Indonesia is greatly challenged by a misalignment of environmental sustainability and social and economic development objectives. Addressing sectoral water governance along institutional, structural, and procedural dimensions is recommended while aiming at environmental sustainability and socioeconomic development (see Agrawal et al., 2022).[3] Solar photovoltaic pumps need strong support to compete with diesel and electrical water utility pumps. Besides water, waste management is also a vital issue. The transformative solutions in the global south must be implemented despite the existing major limitations including lack of awareness, insufficient infrastructure, and lack of government engagement and capacities. Empirical research is needed to understand better the effectiveness of participation in efforts addressing waste and environmental pollution in lands and waters. Participatory schemes should be combined, for example, with suitable structures and balanced engagement of all relevant actors. The mitigation of the impacts of hydrometeorological hazards has improved transboundary river management. The findings suggest that the ecosystem's recovery supports the redevelopment of the livelihoods.

Sustainable oil palm is one of Indonesia's most important issues in environmental governance. It is necessary to understand indirect deforestation, local plantation practices, and their role in the surrounding community to implement sustainable environmental governance. Apart from that, developing second- or third-generation biofuels can also be an alternative to help the government reduce the rate of deforestation. It can help solve the unintended consequence of policies to improve environmental conditions, such as the Biofuel Program. The Indonesian Sustainable Palm Oil (ISPO) is a co-produced knowledge governing Indonesian palm oil for sustainability. The sustainability standard is not only developed for palm oil but also other products, including the energy sector. Renewable energy development is an essential issue in good environmental governance. Building a sustainable photovoltaic (PV) innovation system in Indonesia through the Perspective of Network Governance is one of Indonesia's main renewable energy sources to achieve the national electrification ratio's target. The centralized PV generator (PLTS) and dispersed PV generator (SHS) projects faced unresolved classical problems, impacting unsustaining PV projects in Indonesia. A regional innovation system (RIS) and sectoral innovation system (SIS) as the Indonesian comprehensive policy strategy are necessary to sustain national PV projects. Network Governance (NG) perspective is a lens to capture how actors of academician, business, government, and community (ABGC) interact and collaborate mutually.

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[3] Agrawal, A., Brandhorst, S., Jain, M., Chuan, L., Pradhan, N., and Solomon, D. (2022). From environmental governance to governance for sustainability. *One Earth,* 2022, 5(6), pp. 615–621. https://doi.org/10.1016/j.oneear.2022.05.014

The local community plays an important role in peatland and fire management in three key areas: creating a resilient landscape, developing adaptive fire communities, and implementing a fire management strategy. The lack of affordable no-burning technology for land clearing at the broader community level and the lack of a reward and punishment system have hampered efforts to reduce fires. In addition to the participation of the local community and other stakeholders, leadership is vital in successfully implementing sustainable development. In the forestry sector, Indonesia's Forest Management Units (FMUs) were formed to lead the forest management at a site level, assist the central government as a facilitating institution, and provide a window into understanding ongoing forestry changes. Nevertheless, unfolding policy changes indicate that nongovernment actors are given increased access to permit-based forest use, thus potentially replacing FMUs as key actors at the site level. Although forest use is increasingly entrusted to nongovernment actors, the governance remains hierarchical. The central government is the dominant actor enacting regulatory mechanisms guiding actor interactions and participation. Finally, a conceptual design of sustainable governance in whole sectors has to address the concerns of urban diseconomies of scale, such as traffic congestion, social segregation, conflicts, or the digital divide.

It is the first edited book that attempts to compile diverse research and perspectives on environmental governance issues in Indonesia. Some of the abovementioned perspectives will be discussed, among other important topics. We hope this book can be useful to trigger more collaborations and efforts to bridge sciences, practices, and policies in environmental governance in general and Indonesia in particular.

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Chapter 1
Introduction

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Abstract Indonesia is one of the countries with the fastest-growing economies in Asia and one of the most biologically diverse countries in the world. With ecosystems ranging from terrestrial to marine and teemed with unique life forms, Indonesia is rich in natural resources. Unfortunately, Indonesia also suffers from overexploitation and environmental threats exacerbated by climate and human pressures. Along with the growing global ambitions for achieving sustainable development and increasing its capacity to adapt to climate change and extreme events, Indonesia is also increasing its commitments to balance development while safeguarding environmental and social sustainability. However, challenges remain, especially on how to effectively govern the responses to environmental issues. Against this background, this book will present state-of-the-art environmental governance research and practices in Indonesia. It offers a wide scope, covering different themes and sectors (e.g., climate change, disaster risk, forestry, mining, etc.), diverse physical and societal landscapes (e.g., urban, rural, deltas, coastal areas, etc.), and multiscalar perspectives (from national to local level). This book has the ambition to incorporate more knowledge to indicate research gaps and future directions for

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environmental governance research. Our intention is also to reflect a vision to make the national and global environmental governance research agenda to be more diverse, inclusive, interdisciplinary, and transdisciplinary. We hope that this book will be useful for researchers, students, practitioners, and policymakers who are interested in the field of environmental governance, especially in Indonesia as a megadiversity country that encompasses the world's largest archipelago.

Keywords Environmental · Earth · System · Governance · Indonesia

1.1 Environmental Governance in Indonesia

As in many parts of the world, degradation of the environment is a wicked problem for Indonesia. Indonesia is one of the fastest-growing economies in the world and is experiencing an ongoing dilemma in balancing development and the conservation of its environment. Indonesian citizens are dependent on natural resources that were once abundant but continuously degraded due to mostly unsustainable management and ineffective governance. The 2022 World Economic Forum in its latest global risk report (2022) has stated environmental risk as the top three most severe environmental risks: climate action failure, extreme weather, and biodiversity loss. These, too, are the factual major environmental risks in Indonesia.

Environmental issues in Indonesia range from deforestation, forest degradation, unsustainable agriculture, and unsustainable energy sources, to pollution, emission, mining, and climate change. The increasing intensity and frequency of disasters are also alarming, including flooding, erosion, drought, and wildfires. These disasters are both the cause and effects of environmental degradation. These issues urged Indonesia to better govern its environment and act swiftly to avoid heavier consequences to humans and the ecosystem.

Among the prominent threats in Indonesia is the destruction of carbon storage and biodiversity loss. Indonesia's natural ecosystems such as the unique peat swamps forests on Sumatra and Kalimantan islands store huge amounts of carbon that is threatened by agricultural land conversion (including palm oil) and resulting forest fires. At the same time, biodiversity is lost through climate change, habitat change, invasive alien species, overexploitation, pollution, and poverty as key drivers (ACB, 2010), not to mention capitalism greed.

Following the political reformation era in 1998, Indonesia is struggling to adjust its position from a centralized, power-based, and market-based paradigm (Nguitragool, 2012), to decentralized governance that values autonomy and self-expression at present. Despite the tug of war and resulting pendulum-like power balance between centralized and decentralized movements, the nation is moving toward the goal to achieve sustainable development (see Li & de Oliveira, 2021; Morita et al., 2020; Kurniawan & Managi, 2018). Participation, legitimacy, and accountability became the accepted norms, especially in the race to achieve good status in environmental governance (see Panjaitan et al., 2019; Handayani & Rachmi, 2013).

The ambition to achieve good environmental governance, however, is challenged by the complex social and natural systems and their interactions. Indonesia, as a large archipelagic country, is vastly diverse both in terms of geographical features and sociocultural systems. Indonesia consists of more than 17,500 islands with over 81,000 kilometers (km) of coastline with approximately 273 million population from more than 500 tribes (Purbasari & Sumadji, 2017). Each group has its own culture and beliefs, which includes ways to interact with and manage its environment. The system is also truly dynamic, and environmental problems are transboundary. These features posed a challenge in governing the commons (Ostrom, 1990), especially in terms of achieving inclusive governance with an equal share of resources and benefits (Holzhacker et al., 2016; Triyanti et al., 2017).

The dominant instrument of governing environmental issues in Indonesia is dispositive through institutional and administrative apparatus (Dwiartama, 2018). As a newly democratized country, this approach seems to be logical, which is still preserving the power of the national government to manage the environment. The newly adopted Omnibus law is living proof of this statement. This law has merged different national regulations, including the law 32/2009 in environmental protection and management and the central government gained ultimate power over most of the environmental aspects, which turned out to be beneficial for the extractive companies. An example is an implementing regulation for an environmental impact assessment that weakens the involvement of local authorities and communities, environmental activists, and experts in its process. Despite the power of national regulations to rule the overall environmental governance directive, customary laws are operational on the ground. The uptake of these customary laws into national and subnational law, however, needs significant improvement, particularly the involvement of local and indigenous people in policymaking (Rola & Coxhead, 2005; Syarif, 2010; Bettinger, 2015).

1.2 Dealing with Systemic and Future Challenges: Way Forward

It is clear that the environmental governance in Indonesia needs reforming. To adapt to ever-changing environmental challenges, there is a need to reconceptualize human–nature interactions and ways of managing and governing such complex, dynamic, diverse, and inter-scale problems. Politics and power dynamics are important to explore as it defines the overall governance profile, starting from inherited governance modes (top-down, hybrid, bottom-up governance), problem framing, actors and interactions and actions through regulatory and financial instruments, the consideration of norms and values including social justice, human rights, legitimacy and accountability, and how it all manifested in the implementation on the ground. The question regarding how knowledge is governed and helps inform the decision-making process and efforts to increase human and governance capacity become increasingly relevant.

A major environmental challenge ahead for Indonesia is to meet the Paris Agreement (UNFCCC, 2015) and to ensure that its 1.5-degree pathways can be successful. Indonesia has a strong commitment to limiting global warming to 1.5-degree to meet the Paris Agreement. It is shown by the development of a long-term strategy to potentially achieve net zero in 2060 (Indonesia LTS-LCCR 2050, 2021). However, there is still an ambition gap to fill, especially in order to achieve the national target. Even with the current climate policy in place, Indonesia still needs to decline its greenhouse gas (GHG) emissions immediately to reach 30–48% reductions by 2030 (Climate Action Tracker, 2019). The success of the Paris Agreement among other inter-related global commitments, including reducing disaster risk through the Sendai Framework for Disaster Risk Reduction (UNISDR, 2005), will be crucial in achieving the 2030 Agenda for Sustainable Development through Sustainable Development Goals (SDGs) (UN, 2015).

Against these backgrounds, a new way of thinking is needed, both regarding the development of scientific concepts on environmental governance that fits with the unique context of Indonesia and regular updating of the inventory of good practices in governing the environment. These include how to increase the governability of the emerging environmental issues for sustainability and transformation through innovation, such as energy transition, nature-based solutions, and agricultural and social innovation, among others. Considering that environmental governance is shaped by a diversity of contexts, worldviews, agencies, instruments, and actions, the ideal process to gather usable knowledge is through interdisciplinary and transdisciplinary knowledge. The role of private sectors in environmental governance in Indonesia should also be explored further, especially in increasing their environmental, social, and governance (ESG), focusing on measurable outcomes such as sustainability reporting. In this book, over 90 authors have joined forces to share their research and perspectives. This edited book is presented as our first attempt to compile existing knowledge on environmental governance in Indonesia, unfold the complex and systemic nature of environmental problems, and to trigger more debate and collaboration between different scientific disciplines and societal stakeholders.

1.3 Structure of This Book

This book is divided into six parts: (1) Emerging concepts and perspectives; (2) Marine, coastal, and wetland; (3) Forest; (4) Urban; (5) Climate; and (6) Social and technological intervention.

1.3.1 Part I: Emerging Concepts and Perspectives

Mahaswa and Kim discuss the idea of the Anthropocene and the pluriverse as an opportunity to give serious consideration to the ontological thesis that "social" relations are constituted by "more-than-human" beings. They suggest that an "ontological politics" toward the recognition and preservation of many kinds of worlds can

be understood in Indonesia as a struggle to deepen Bhinneka Tunggal Ika (Unity in Diversity), which is the modern Indonesian state that has long professed to be one of its foundational principles. This chapter is followed by **Nugraha et al.** discussing the emerging earth system governance (ESG) and the state-of-the-art how the notion interacts in and with Indonesian academia. The chapter elaborates on the potential of the ESG framework to inform the corpus theory of sustainable futures in the Indonesian context. The third chapter by **Permana et al.** discusses the idea of post-politicization of the environment. It starts with an exploration of the current intensifying threat of ecological disaster due to excessive natural resource exploitation and environmental damage in Indonesia and the importance of the existing tools to evaluate local government performance on natural resource and environmental management. This chapter highlights the critics of the technocratic mode character as a disguise to facilitate politico-business linkages and oligarchical interests that damage the environment.

1.3.2 Part II: Marine, Coastal, and Wetland

Saputro and Kurian investigate the implications of climate change impacts on the lives of women and men in a small and vulnerable coastal community on Pramuka Island, a part of the group of Seribu Islands, Jakarta, Indonesia. This study examines how changes in women's and men's employment, income, and time management reflect how environmental changes, including climate change, shape the everyday lived experiences of vulnerable local communities of small islands. **Adhuri et al.** highlight the issue of land and coastal grabbing as a global concern. They argue that while most studies focus on grabbing and their socioenvironmental impacts, their chapter demonstrates the process of "re-grabbing" where the local community, supported by NGOs and other agencies, took back control over the coastal mangrove forest taken and converted by a private company for palm oil plantation. This chapter further explains the process and strategies employed by coastal communities in Langkat, North Sumatra in resisting the palm oil plantation's presence that had impacted their fishing and coastal livelihoods seriously. **Yuniarti et al.** analyze current management performance to achieve a sustainable lake ecosystem-based management. The chapter focuses on the goals of reduced cage aquaculture and improved water quality in the lake, despite the presence of formal regulations for reaching these goals. It provides lessons learned through interdisciplinary research (environmental–social science, ecology, and ecological economics), evaluating cage aquaculture management scenarios to facilitate sustainable cage aquaculture management in Lake Maninjau, Indonesia.

1.3.3 Part III: Land and Forest

Nurhidayah et al. explicate the role and challenges of community-based fire management and peatland restoration based on the Community Fire Brigades or Masyarakat Peduli Api (MPA) through case studies of six villages situated in two fire-prone provinces in Riau and Central Kalimantan. A cohesive fire management strategy model has been employed as a lens to understand the challenges and effectiveness of a community-based fire management strategy in Indonesia. The result has shown diverse challenges that reduce their capacity to prevent and control forest and land fires and proposed a suggestion for the Indonesian government to prioritize funding support for MPAs to ensure the effective operationalization of community-based fire control and prevention in fire-prone provinces. Additionally, they highlight the importance of strengthening the role of the private sector and NGOs to step in to address the gap in support for community-based fire management and peatland restoration. **Ramli Ramadhan et al.** apply the governance approach to understanding changes in the forestry sector using four modes of governance, including hierarchical governance, closed co-governance, open co-governance, and self-governance. Through the case of the forest management unit, the study revealed that although forest use is increasing and being entrusted to nongovernment actors, the governance remains hierarchical, whereby the central government is the dominant actor enacting regulatory mechanisms guiding actor interactions and participation and has not yet departed from previous modes of governance. **Rizky Ramadhan et al.** discuss the topic of biofuel development and indirect deforestation. They investigate the land-use changes in the Riau and Central Kalimantan Province as the largest palm oil producers, using the geographic information system (GIS). The findings of this research are intended to understand indirect deforestation, local plantation practices, and their role in the surrounding community and solve the unintended consequence of policies aimed at improving environmental conditions such as the Biofuel Program. **Sari et al.** employ a political economy approach to explore how the interactions between the political economy structure, institutions, and actors have resulted in the slow implementation of green policy commitments, particularly in reviewing the compliance of land-based industry licenses and acknowledging customary (adat) areas in Papua Land. The findings suggest that the reform is mainly driven by development partners and limited numbers of bureaucrats. The small coalitions were successful in focusing their effort on enacting green policies in the two provinces. However, the study highlights constraints posed by these actors to turn the policies into actions. **Hapsari** explores how knowledge co-production works in the emergence of permaculture movements in Indonesia within the broader literature on social movement and counter-hegemonic politics. This study is based on the experiences of four permaculture communities in Indonesia. It reveals that the formation of permaculture movements in Indonesia involves negotiated boundaries among different ways of knowing in the epistemic relations surrounding permaculture practices. The critical distancing that develops between the movements and the hegemonic knowledge structure seeks to transform

agro-industrial knowledge practices toward an alternative knowledge system. **Salman and Mori** discuss the concept of knowledge co-production further through the case of the Indonesia Sustainable Palm Oil (ISPO) as a product of knowledge co-production. This study use the principles for high-quality knowledge co-production for sustainability to look more into the cooperation and compliance gaps providing additional nuance on why such gaps exist. The findings show that on top of the existing operationalization problem, ISPO is a knowledge co-produced to endorse the government's predetermined agenda and discuss the way forward to achieve sustainability.

1.3.4 Part IV: Urban

Mulyana et al. develop the conceptual models of dynamic governance model in urban water governance. This research uses a qualitative method by utilizing a soft system methodology (SSM) to develop a dynamic conceptual model that can be useful to implement in an urban area. This chapter also showcases the result of the adapted model in Bandung Metropolitan Urban Area as an implementation strategy in a fast-growing urban area. **Setianto and Widianarko** further discuss the role of the civil society movement in environmental governance in Indonesia. Through literature review, the research provides a theoretical framework for the dynamic adaptations occurring in the Indonesian government concerning the emerging civil society movements and the political turmoil (from authoritarian to more democratic governance) associated with them. This study demonstrates that civil society movements are not a single homogeneous entity and dissemination of power among governmental structures is not merely a technical matter aiming to provide a better service but also a notion of political power contestation. Finally, the dynamic relationships within civil society organizations, the multilevel governmental institutions, and the various stakeholders in the private sector have led to a mode of governance called the "governance by accident," instead of "governance by design" as a new model of environmental governance.

Pambudi and Kusmanto in their chapter discuss the challenge of urban water governance in Indonesia and provide a comprehensive review of laws, regulations, and policies associated with water conservation and how they play out at the implementation level. They argue that the underlying problem is not so much a lack of policies but rather the prevalence of overlaps of regulations, leading to weak and uncoordinated implementation. **Clegg et al.** explore the issue of flood governance in Indonesia. Through the case of the Ciliwung River in Java, Indonesia, they identify decentralized governance as a significant challenge to achieving integrated river management to mitigate flooding, where plans need to be carefully coordinated and high levels of collaboration are required, and improved transboundary river management is needed. **Abdulnabi Ali et al.** discuss the problem of global solid waste in the global south. Using the case of Jakarta, the study analyzes how participative processes within sustainable solid waste management efforts in Jakarta are executed

to investigate potentials and obstacles that evolve during the implementation. The results reveal that the waste problems in Jakarta are complex, interrelated, and multilayered. While participatory procedures have been acknowledged by the organizations to be highly relevant for waste management, such approaches should be adapted depending on the local circumstances and actors.

1.3.5 Part V: Climate

Firdaus et al. analyze the fate of climate actions during the Covid-19 pandemic in Indonesia and develop a crisis management framework to provide insights about governing climate change under the Covid-19 pandemic while seizing the opportunities to achieve the climate target. The chapter ends with a proposal for redesigning climate policies, including financing mechanisms and improving the governance in climate adaptation and mitigation. **Karuniasa et al.** explore the issues of capacity building in the context of a highly complex governance setting of Indonesia's more than 500 districts, each with their specific issues around mitigation and adaptation that pose challenges for both top-down and equally important, bottom-up approaches. The chapter suggests that the institutionalization of capacity-building is key in highlighting the role of civil society networks—especially those that can reach the far-flung districts of Indonesia—in creating trust in the regions where they are distributed. Finally, **Ridwansyah et al.** examine the strategy for urban climate mitigation. The chapter explores the case of Kupang City as one of the cities in Indonesia that is vulnerable to disasters caused by climate change. In this study, the geographical, demographic, and socioeconomic characteristics of Kupang City are analyzed to find the shortcomings and the challenges faced to implement policies related to climate risk reduction. This study comes up with seven priority sectors that should be considered to resolve the disasters and challenges caused by climate change, including climate change adaptation and disaster risk reduction, water and sanitation, energy and transportation, solid waste management/municipal waste, sustainable use of resources, GHG emission inventory, and financing.

1.3.6 Part VI: Social and Technological Interventions

Turner-Walker unravels the local-level governance characteristics and interactions influencing climate change adaptation prevalent in marine-agrarian coastal island resource bases. Drawn through comparative case studies of coastal area communities in Central Java and Central Maluku, the chapter explores how local resource governance drives the ability to deal with environmental pressures, conflict, and change. The chapter is relevant for understanding how the ways of governing, innovating, and engaging strategies of adaptation to change throughout rural and coastal regions of Indonesia.

The chapter by **Rahmani et al**. discusses the management of sustainability transition that emerges in various types of community-scale projects. The study was conducted on the implementation of solar water pumping systems (SWPS) project in Yogyakarta Province, Indonesia, and showed some governance challenges, including insufficient training and lack of funds for damage repair. It highlights the need for an iterative process of learning and network building. To achieve the sustainability transition, they argue that it is imperative to build a vision and deep networks within local government rather than simply replicate the number of project installations.

Asmara et al. focus on the implementation of photovoltaic (PV) innovation as one of the main renewable energy sources aimed to achieve a national electrification ratio in Indonesia. This study finds that PLTS/ SHS projects face unresolved classical problems over the years to sustain PV projects in Indonesia. This study proposes a regional innovation system (RIS) and sectoral innovation system (SIS) as the Indonesian comprehensive policy strategy to sustain national PV projects. Network governance (NG) perspective is a lens to capture how actors of academic, business, government, and community (ABGC) interact and collaborate mutually. **Santoso et al**. further highlight that the dimensions of the triple bottom line approach to sustainable development contain inherent conflicting goals in implementation and fragmentation. This study serves to overcome fragmented approaches by using a holistic, sustainable governance transition process for integrating urban and port–industry governance concepts. A novel online platform, VIDEL (Virtual Dashboard of Environmentally Logistics-Port-City), is designed as a smart system that engages all stakeholders. This platform binds the requirements and interests as well as harmonizing actors in the interactions of urban with port and industry to secure innovative and environmentally friendly ways. It will become a digital control tower for a sustainable governance system in a port city.

References

ACB. (2010). *ASEAN Centre for Biodiversity: ASEAN biodiversity outlook*. Dolmar Press Inc., 208 pp. [ISBN 978-971-94164-4-9].

Bettinger, K. A. (2015). The fight over the forest: The state, rural communities, and customary law in Indonesia. *Worldviews: Global Religions, Culture, and Ecology, 19*(2), 123–143.

Climate Action Tracker. (2019). *Scaling up climate action: Indonesia*. Climate Action tracker. https://climateactiontracker.org

Dwiartama, A. (2018). From 'disciplinary societies' to 'societies of control': An historical narrative of agri-environmental governance in Indonesia. In *Agri-environmental governance as an assemblage* (pp. 91-104). Routledge.

Handayani, I. G. A. K. R., & Rachmi, G. A. K. (2013). Embodying green constitution by applying good governance principle for maintaining sustainable environment. *JL Pol'y & Globalization, 11*, 18.

Holzhacker, R. L., Wittek, R., & Woltjer, J. (2016). Decentralization and governance for sustainable society in Indonesia. In *Decentralization and governance in Indonesia* (pp. 3–29). Springer.

Indonesia LTS-LCCR 2050. (2021). *Indonesia long-term strategy for low carbon and climate resilience 2050* (Indonesia LTS-LCCR 2050).
Kurniawan, R., & Managi, S. (2018). Economic growth and sustainable development in Indonesia: An assessment. *Bulletin of Indonesian Economic Studies, 54*(3), 339–361.
Li, W., & de Oliveira, J. A. P. (2021). Environmental governance for sustainable development in Asia. *Journal of Environmental Management, 290*, 112622.
Morita, K., Okitasari, M., & Masuda, H. (2020). Analysis of national and local governance systems to achieve the sustainable development goals: Case studies of Japan and Indonesia. *Sustainability Science, 15*(1), 179–202.
Nguitragool, P. (2012). Environmental governance in democratic and decentralised Indonesia: Between state, family and conservation. *European Journal of East Asian Studies, 11*(1), 45–69.
Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.
Panjaitan, R. B., Sumartono, S., Sarwono, S., & Saleh, C. (2019). The role of central government and local government and the moderating effect of good governance on forest fire policy in Indonesia. *Benchmarking: An International Journal*.
Purbasari, K., & Sumadji, A. R. (2017). Variasi pola sidik jari mahasiswa berbagai suku bangsa di Kota Madiun. *Jurnal Florea, 4*(2).
Rola, A. C., & Coxhead, I. (2005). Economic development and environmental management in the uplands of Southeast Asia: Challenges for policy and institutional development. *Agricultural Economics, 32*, 243–256.
Syarif, L. M. (2010). The source of Indonesian environmental law. *IUCN Academy of Environmental Law, 1*, 1–18.
Triyanti, A., Bavinck, M., Gupta, J., & Marfai, M. A. (2017). Social capital, interactive governance and coastal protection: The effectiveness of mangrove ecosystem-based strategies in promoting inclusive development in Demak, Indonesia. *Ocean & Coastal Management, 150*, 3–11.
UN. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.
UNFCCC, C. (2015, June). *Decision 1/CP. 21, adoption of the Paris Agreement*. In Report of the conference of the parties on its twenty-first session, held in Paris from 30 November to 13 December 2015 Addendum Part Two: Action taken by the conference of the parties at its twenty-first session (FCCC/CP/2015/10/Add. 1).
UNISDR (United Nations International Strategy for Disaster Reduction). (2005). *Hyogo framework for action 2005–2015: Building the resilience of nations and communities to disasters*. UNISDR.
World Economic Forum. (2022). *The global risks report 2021*. WEF. Available online at: https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2022.pdf

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Part I
Emerging Concepts and Perspectives

Chapter 2
Introducing the Pluriverse of the Anthropocene: Toward an Ontological Politics of Environmental Governance in Indonesia

Rangga Kala Mahaswa and Min Seong Kim

Abstract This chapter introduces an idea that is gaining increasing prominence in discussions of the Anthropocene: the idea of the pluriverse. We argue that the very condition of the Anthropocene can serve as an opportunity to give serious consideration to the ontological thesis of the pluriverse, namely that there are many *kinds* of worlds, some of which may allow for "social" relations that are constituted by "more-than-human" beings. In the first part of the chapter, we draw from the literature on the pluriverse and studies of indigenous worlds that have appeared in the past decade to elaborate on the idea of the pluriverse, highlighting, in particular, the ethical motivation that underpins calls to recognize different kinds of worlds. In the second part of the chapter, we consider the implications of the pluriverse in Indonesia, particularly in relation to "*adat* revivalism" and CSR practice. We suggest that an "ontological politics" toward the recognition and preservation of many kinds of worlds can be understood in Indonesia as a struggle to deepen *Bhinneka Tunggal Ika* (Unity in Diversity), which the modern Indonesian state has long professed to be one of its foundational principles.

Keywords Anthropocene · Pluriverse · Ontological politics · Indigeneity · *Adat* revivalism

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2.1 The Pluriverse of the Anthropocene

The thesis that the appearance of humankind marks the beginning of a distinct geological time unit has been entertained since the early twentieth century, under terms such as "Psychozoic," "Anthropozoic," "Noosphere," "Gaia," and the "Anthropocene"—a word that is known to have been used by Soviet scientists in the mid-twentieth century. The Anthropocene drew renewed attention in the early 2000s, after Paul J. Crutzen proposed it as the name of a new geological epoch, which can be distinguished from the Holocene by the emergence of *Anthropos*, or humans, as a *geological force* whose activities on the planet generate apparent and measurable effects (Crutzen, 2016).

Exactly when the Anthropocene begins, if it can be given a more formal stratigraphic definition at all, has been a matter of debate (Malhi, 2017). Some proponents of the Anthropocene thesis have suggested its pre-historic beginnings in the human discovery of fire, adoption of enhanced hunting-gathering techniques, and the domestication of plants and animals. Others have regarded the onset of modernity and the Industrial Revolution, with the increase in the use of fossil fuel and mass manufacture, as the beginning of the Anthropocene. Amidst the increasing interest in the thesis that human presence has impacted the planet to a sufficient degree to merit its recognition within Earth's geological timescale, the Anthropocene Working Group (AWG) was established in 2009 as a part of the Subcommission on Quaternary Stratigraphy—a constituent body of the International Commission on Stratigraphy—with the aim of engaging in a more in-depth investigation that should lead toward the identification of the formal basis of a rupture between the Holocene and the Anthropocene. What the group sought to determine was a global marker in the environment that indicates the start of a distinctive geological epoch, a novel "golden spike."

Today, it is widely accepted that the dramatic increase in anthropogenic activities affecting the planet beginning in the 1950s, often referred to as the "Great Acceleration," marks a significant turning point in planetary history (Steffen et al., 2015). The extent to which anthropogenic activities can be considered geological forces is such that a term such as "teleconnections"—far-distant perturbations that prove to be coupled by hidden bonds—that had been used to refer to fluctuations in atmospheric pressure and earthquakes in geographically distant areas can plausibly be expanded to encompass anthropogenic phenomena that might include the flow of capital or energy consumption (Davies, 2016). More recently, the Covid-19 pandemic that began in 2020, too, has been described by some as the "disease of the Anthropocene" (O'Callaghan-Gordo & Antó, 2020)—an expression designed to highlight the fact that many of the conditions of possibility of the Covid-19 pandemic, from cross-species transmission of viruses to the rapid appearance and spread of variant strands, were in large part human-made. It is no exaggeration to say that "human societies are now among the most powerful of the ecological forces that operate on, above, and below the surface of the earth" (Davies, 2016, p. 10).

In light of its primary aim of producing an understanding of the Anthropocene toward its formal inclusion in geological research, the AWG had, during the first several years of its existence, tended to exclude research and findings outside the discipline of geology, not least to minimize ambiguity and confusion in defining the Anthropocene in formal geological terms (Zalasiewicz et al., 2019). However, the Anthropocene thesis has quickly crossed disciplinary boundaries and is now a major basis for research in disciplines such as sociology, political theory, cultural studies, history, and philosophy (Clark & Yusoff, 2017; Davis & Turpin, 2014; Haraway et al., 2016; Malhi, 2017), as well for the increasingly important multidisciplinary research program of Earth System Governance (Biermann et al., 2012). We are in full agreement with Christopher Hohnë's view that "emerging economies need to become more central to the Anthropocene discussion, as they themselves have become strong drivers of global environmental change" (Höhne, 2018, pp. 124–125). The contemporary discourses around the idea of the Anthropocene are particularly relevant for Indonesia, as Hohnë points out, for the country now stands among the largest emitters of greenhouse gas in the world, with a historical per capita emission that is greater than that of the European Union.

Given the interest that the Anthropocene thesis has garnered across a variety of disciplines, it has, naturally, been taken up in different ways, and the ultimate import of various discussions around the Anthropocene does not necessarily cohere into a single vision or set of proposals. Nevertheless, in our view, the most interesting and novel perspectives opened by the Anthropocene thesis can only proceed from the recognition that, despite having its conceptual origins in recognition of the far-reaching impact of human intervention on the planet, the Anthropocene, as such, is not an anthropocentric concept (Mahaswa & Widhianto, 2020). While the Anthropocene thesis conceives humans as a geological force and the possible source of geological changes, it also dislocates, precisely by placing humans alongside nonhuman forces and entities, the exceptionality of the human that underpins anthropocentrism. As Jeremy Davies, defending the anti-anthropocentric implications of the Anthropocene thesis, writes: "Humanity is not at the center of the picture of the Anthropocene, opposing, by its powers of mind, the passive matter center that encircles it. Instead, human societies are themselves constructed from a web of relationships between human beings, nonhuman animals, plants, metals, and so on" (Davies, 2016, p. 7).

In this chapter, we introduce one of the ideas that has gained prominence over the past decade in discussions of the Anthropocene thesis: the idea of the pluriverse. In our view, the very condition of the Anthropocene itself can serve as an opportunity to give serious consideration to the notion of the pluriverse and to take it as the ontological ground of human—and indeed nonhuman or "more-than-human"—existence. In the first part of this chapter, we draw from some of the key literature on the pluriverse and studies on non-Western, indigenous worlds that have appeared within the past decade to elaborate the idea of, and the motivation for, the pluriverse. According to this growing body of literature, to understand the condition of the Anthropocene from a pluriversal perspective is to recognize that reality is composed of not one but many worlds, some of which have long been threatened to extinction

by the domination of one particular world characterized by the pursuit of Western-centric modernization and capitalist exploitation. In this respect, the proposition of the pluriverse as the ontological ground of the Anthropocene is an ethically motivated one—a point that we illustrate by adapting the idea of the "differend" from the French philosopher Jean-François Lyotard (1989). The second half of this chapter considers how the discussions on the pluriverse may be relevant in the Indonesian context. In particular, we propose that the "ontological politics" elaborated by some of the key thinkers of the pluriverse offers a novel perspective for approaching the recent phenomenon of "*adat* revivalism" in Indonesia.

2.2 "Many Worlds Make Us": A Pluriversal Politics

Accepting the pluriverse as the ontological ground of the Anthropocene implies a stance that goes a step beyond pluralism. Whereas the latter implies the acceptance of "many worlds" *qua* social spaces constituted by culturally different human groups, the pluriverse—as a subversion of the notion of universe—implies an explicit recognition of many *kinds* of worlds, some of which may allow for "social" relations that are constituted by "more-than-human" beings. A pluriversal outlook of this kind is called for by the declaration of the Zapatista movement, reproduced below:

> Many words are walked in the world. Many worlds are made. Many worlds make us. There are words and worlds that are lies and injustices. There are words and worlds that are truthful and true. In the world of the powerful there is room only for the big and their helpers. In the world we want, everybody fits. The world we want is a world in which many worlds fit. […] Softly and gently we speak the words which find the unity which will embrace us in history and which will discard the abandonment which confronts and destroys us. Our word, our song and our cry, is so that the dead will no longer die. We fight so that they may live. We sing so that they may live. ("Fourth Declaration of the Lacandón Jungle," Ejército Zapatista de Liberación Nacional (1996), as translated in de la Cadena & Blaser, 2018, p. 1)

The Zapatista declaration has been a reference point in discussions on the pluriverse within and without academia (de la Cadena & Blaser, 2018), and the message ensconced therein merits further elaboration. An Australian court case in the 1990s discussed by Gelder and Jacobs (1998) can serve as a useful point of entry for understanding the motivation for and implications of the vision of "many words" and "many worlds" invoked by the Zapatista.

The case in question involves two plaintiffs: a construction company that is set on developing an island, and a group of aboriginal women claiming that the island is their sacred site. While the court is willing to hear the case put forth by the aboriginal women, the women's lawyer explains that according to the aboriginal beliefs, the meaning of the site must remain a secret transmitted over the generations through the maternal lineage and that the disclosure of the secret to anyone else would desacralize the site. If the aboriginal women do not provide the evidence demanded by the court, they lose the case, but if they were to provide the evidence, they would

also lose the case as the site would have lost its holiness in their eyes. The objects referred to by the utterances of the aboriginal women are simply nonexistent for others in the courtroom. This sort of impasse, which the French philosopher Jean-François Lyotard proposes to call "differend" (Lyotard, 1989), signifies a clash between the incommensurable ways in which particular things are disclosed to, or experienced and handled by different groups or individuals—processes that would be described by key thinkers of the pluriverse in terms of "world-building" practices, or *worldings* (Anderson & Harrison, 2012; Mercier, 2019).

Lyotard suggests that the task of philosophy is to bear witness to cases of *differend* and to help invent new idioms common to the parties implicated in those cases. As a *differend* attests to the inadequacy of the expressive potential of prevailing discourses, its resolution would only be possible under the invention of new discourses. "To give the differend its due," write Lyotard, "is to institute new addressees, new addressors, new significations, and new referents in order for the wrong to find an expression" (Lyotard, 1989, p. 13). Justice, Lyotard suggests, consists in the invention of what he calls a new "phrase-universe" that would contain new referents, addressees, and modes of legitimation, that is, a new system of meaning, or discourse, that cannot but be different from any such system available to the two parties.

Lyotard's writing—*Le Différend* was published in France in 1983—predates the advent of the contemporary discourse of the Anthropocene and the pluriverse by at least a couple of decades. Lyotard did not make the further step of characterizing the *differend* as a notion that points beyond the clash of different *discourses*, implicitly prioritizing thereby the linguistic construction of objectivity. Contemporary discussions on the pluriverse, however, draw from theories of "new materialism" that have gained a significant foothold in philosophy and social sciences in the past two decades, asserting, in effect, that the *differend* evinced in the preceding case of the aboriginal sacred site as a matter of *being*. According to this view—and the further step taken here is arguably the logical outcome of Lyotard's thought—it is not that there are different, sometimes incompatible, manners of "looking at" or "talking about" one and the same external world. Rather, the difference goes, so to speak, all the way down: there is in fact a plurality of worlds and world-building practices involved in the impasse because one world may encompass entities that cannot be entities of another world, such as islands that bear ancestral secrets that resist transmission except to the select few.

The increasing significance in contemporary societies of clashes of the kind describable in terms of the "ontologized" version of the Lyotardian differend underpins the need to conceptualize what Marisol de la Cadena and Mario Blaser—drawing from ideas elaborated by philosopher Isabelle Stengers—have called "ontological politics," which they define as an "imaginary for a politics of reality, and a field that stands where political economy and political ecology, formulated with ideas of nature and economic growth, are insufficient (at times even unable) to think antagonisms that, for example, involve things like mountains and forests that emerge as resources through some practices but also as persons through other practices" (de la Cadena & Blaser, 2018, p. 5). For too long, those who advocate the need for

ontological politics would argue, it has been taken for granted that we already know which entities deserve our attention when so much of the struggles of indigenous peoples have involved getting governments and multinational corporations to recognize the existence of the entities that integral to their worlds. In other words, before we can even speak of conservation and sustainability, what has to be determined is *what is there* to be recognized, conserved, and sustained. That the determination of this matter must involve the expression of and interaction between a plurality of potentially irreconcilable worldings renders ontological politics an irreducible dimension of contemporary environmental governance.

The pluriverse, understandably, is a recurrent theme in today's activist and progressive academic circles. In some cases, the idea has been taken up outside activist movements and scholarly publications, even receiving state recognition. Catherine Walsh (2018), for example, has shown how the Ecuadorian Constitution has implemented the indigenous concept of *Buen Vivir*—roughly translatable as "living well" or "collective well-being"—to curtail rampant developmentalism, a concept and word that, according to Walsh, "does not exist in the cosmovisions, conceptual categories, and languages of indigenous communities" (Walsh, 2018, p. 184). Concepts associated with indigenous worldings or cosmovisions unassimilable to the developmentalism enabled by the Western conception of modernity are found elsewhere in Latin America and beyond (Peredo, 2019). To list a few: according to anthropologist Francis B. Nyamnjoh, the universe of West Africa's Yoruba people is one in which consciousness "can inhabit any container—human and non-human, animate and inanimate, visible and invisible" (Nyamnjoh, 2017, p. 28), hence one that allows for a variety of relations between humans and nonhumans alien to the modern, anthropocentric, world; the Southern African value of human mutuality has been elaborated around the notion of *ubuntu* (Binsbergen, 2001); the Indian concept of *swaraj* implies a unique view of self-reliance and self-governance (Kothari, 2018); an understanding of the relation between nature and human beings called *Pachamama*—sometimes rendered (though not unproblematically) in English as "Mother Earth"—is an integral part of the Andean imaginary (Mamani-Bernabé, 2015). Notions drawn from indigenous cosmovisions have inspired socially transformative initiatives across the world that seek to subvert prevailing modes of environmental governance (Chandler, 2019; Chandler & Reid, 2019; de la Cadena, 2010; Escobar, 2020; Kallis et al., 2020), which verge on—to borrow a concept popularized by the Cameroonian philosopher Achille Mbembe—a *necropolitical* alliance between state and capital.

In the Anthropocene, the magnitude of human intervention is such that it has become capable of inducing planetary-scale changes, with repercussions that cannot always be foreseen (Davies, 2016). As the climate crisis of our time demonstrates, some of the repercussions of anthropogenic activities are threatening for humans themselves, indeed, for the existence of the dominant world—one that the Zapatista declaration describes as "the world of the powerful"—governed by logics of capital and resource development. Under such a condition of a new *terra incognita*, calls to recognize many kinds of worlds highlight the nature and extent of the threats of the Anthropocene that remain unrecognizable to the dominant world. If

the Anthropocene thesis enjoins us to see that humans have become capable of destroying a world, the pluriversal paradigm on the Anthropocene enjoins us to see that there are *worlds* that are under threat or have already been destroyed by the very same process that threatens the dominant world. Emerging from the peripheries of a world founded on Western-centric modernity and developmentalism, pluriversal ontological politics are nothing less than struggles to preserve worlds and the human and nonhuman beings within them. From the pluriversal perspective, negligence of the destruction of these "other" worlds while the dominant world values its self-preservation constitutes a wrong, an unjustifiable outcome of a solipsistic anthropocentrism built into Western rationalism that had closed the dominant world responsible for the destruction of a plurality of worlds off from worlds other than itself.

Activists and thinkers drawn to the idea of the pluriverse have sought to articulate the possibility of a convivial co-existence of worlds, an arrangement that would allow everyone to coexist with dignity and peace, without being subjected to diminishment, exploitation, and misery (Kothari et al., 2019). In seeking such a possibility (unknown, so far, to the dominant world of "lies and injustices"), some theorists have noted fundamental proximity in the relational ontologies that underpin Daoist and Buddhist worldviews as well as the Andean cosmovision (Querejazu, 2016). These relational ontologies emphasize, according to Querejazu (2016), the balanced unity, complementarity, and reciprocity between entities—no one entity can exist without others, and it is only in co-existence that an entity can be said to exist in full. This relationality promotes, in turn, fundamental equality in every aspect of a variety of relations that can form between the human, the natural, the spiritual, and the cosmic. The pluriverse that emerges from the Andean cosmovision would be one that encompasses not only human worlds but also nonhuman worlds, in which souls of the dead, forces of nature, and supernatural beings exist as autonomous entities with which humans can communicate through "the language of symbols, rituals and special skills that some humans can develop" (Querejazu, 2016, p. 9).

Further elaborations of ontological precepts embedded in indigenous worldings have gone hand-in-hand with developments in contemporary philosophy. Aside from the aforementioned Stengers, the thoughts of Donna Haraway (2015), Rosi Braidotti (2019), Manuel DeLanda (2019), Bruno Latour (2014, 2017), and Graham Harman (2018) have been influential in fostering sophisticated inquiries into the ontological being of the pluriverse. Notwithstanding the differences between their theories, what these thinkers advocate is a "flat" ontology wherein the relation between the human and the nonhuman would be one in which one enjoys neither ontological nor ethical primacy over the other (Harman, 2018; Morton, 2013). What new perspectives on the relation between the human and the nonhuman these ontologies will open awaits to be seen, but the broad ethical implication of the pluriversal perspectives can be stated succinctly: the ethics of the pluriverse is an ethic for worlds in which humans would occupy a much more humble place.

2.3 Towards an Ontological Politics of Environmental Governance in Indonesia

Indonesia is one of the most culturally diverse countries in the world, comprising over a thousand ethics groups spread across more than 17,000 islands, though the majority of the country's population resides in the five main islands of Sumatra, Java, Sulawesi, Kalimantan (Borneo), and Papua (New Guinea), and the archipelagos of Nusa Tenggara and Maluku. The cultural diversity of the archipelago posed a challenge for Indonesia's founding figures, who wished to found a modern state wherein the people would come to share a common national civic identity regardless of the differences between their ethnic and regional backgrounds. Confronted with the task of establishing a political unity on the culturally and geographically diverse archipelago, Indonesia's nationalist leaders relied on the strategy of establishing national unity through the promulgation of a single national ideology, the *Pancasila*, which was promoted as the embodiment of the shared values, emotions, and the singular *Weltanschauung* of the people of the archipelago (Bourchier, 2015). The essence of the vision of Indonesia that has been pursued and legitimated through appeals to the state ideology since the country's independence is perhaps best expressed by its official motto, *Bhinneka Tunggal Ika* (Unity in Diversity): Indonesia would be a country in which ethnic minorities retain a large degree of cultural autonomy, but only in so far as they do not undermine the unnegotiable principle of national unity.

The role and consequences of the Pancasila ideology, which has often been used as an "inclusive myth" to which Indonesian leaders appeal in order to mend social disharmony, are well documented (O'Shannassy, 2010, p. 54). However, whereas most scholarships on the exclusionary or oppressive dimension of Pancasila and the discourse of national unity both within and without Indonesia tend to focus on its use by the state and ruling elites to suppress their ideological rivals and supposed threats to social unity such as political Islam, communism, and Western liberalism (Iskandar, 2016), Pancasila has not been subjected to as much critical scrutiny from the perspective opened by the Anthropocene and the pluriverse. Still, the beginnings of critical discussions of that sort can be found in some recent works by Indonesian scholars. For example, political theorist Shofwan Al Banna Choiruzzad (2020) has argued that one of the conditions of possibility of Anthropocene in the Indonesian context has been that of *anthrocentrization*, understood as the "gradual process of replacement/displacement or domination of nonanthropocentric political-economic governance, in which the relationship of humans with nature is based on respect and harmony, by anthropocentric political-economic governance, in which humans are at the centre and nature is exploited for the interest of humans" (Choiruzzad, 2020, p. 144). Choiruzzard traces the beginning of this process of anthropocentrization of political and economic governance to colonial state-building in the mid-nineteenth century that was designed with the singular aim of more efficient exploitation of resources through the creation of a unified market, which in turn displaced the systems of ecological governance found in indigenous communities.

Post-independence Indonesia witnessed further institutionalization of anthropocentric governance. In particular, the relentless pursuit of a developmentalist agenda during the three decades of the authoritarian New Order regime (1965–1998) had the effect of further marginalizing indigenous communities. Despite the state's formal recognition of the *adat*—an expansive concept that refers to the beliefs, customs, and traditions of the country's diverse indigenous peoples (van der Muur et al., 2019)—law that governs such communities, the New Order insisted, partly to consolidate its power, on the congruence of its dirigiste model of national development and the practical implementation of Pancasila (Robison, 1996). The elevation of the Pancasila in the early 1980s to the status of *asas tunggal*—the sole ideological foundation—of all social forces, including political parties and religious organizations, ensured that indigenous voices would find little representation in national politics. National unity, while imposed most aggressively during the New Order (Abdullah, 2003; Ulum & Hamida, 2018), is an ideal that continues to govern the Indonesian state's stance toward diversity, according to which cultural, religious, and other forms of diversity are secondary to the ideological homogeneity represented by Pancasila and the official motto as interpreted by the central government in Jakarta.

Decentralization has been one of the prime characteristics of the post-Reformation era that followed the fall of the New Order. The devolution of authority from the center to the peripheries that followed the passing of the landmark Decentralization Laws in 1999 loosened the power and control of the central government and exacerbated the effects of globalization, such as fragmentation, decentralization, and internationalization of state apparatuses (Nordholt & Klinken, 2007; O'Shannassy, 2010; van der Muur et al., 2019). The devolution of power, with the concomitant deterioration of the ideological grip of Pancasila, raised new challenges for Indonesia's central government, one of the most notable manifestations of which is the emergence of indigenous social movements around *adat*.

"*Adat* revivalism" is one of the most prominent forms of political undertaking in the current post-Reformation Indonesia. It is aimed at "transcending uneven socio-political conditions and economic relations" (Tyson, 2011, p. 653) by appealing for the recognition of the rights of the indigenous groups that have been victimized by the developmentalist ideology that had remained hegemonic in Indonesia for much of its modern history. The struggles of indigenous communities present very different worldviews and world-building practices than the dominant versions. According to Tyson, *adat* revivalism is "a social construction, a matter of becoming indigenous based on selective representations, articulations and deployment of the past" (Tyson, 2010, p. 5), which harbors the possibility of empowering indigenous populations to challenge clientelism—dependency relationship between the weak and the powerful where the former is led to sell their autonomy to the latter—that persists in rural Indonesia, deepen local people's participation in community mapping, and increase their representation in regional and national governments. Moreover, the revival of traditional cultural practices outside Java, such as in western Flores (Erb, 2007) and Sumatra (Biezeveld, 2007), can be seen as reactions against the Javanese political and cultural hegemony in Indonesia. But the most politically consequential

employment of *adat* in post-Reformation Indonesia has been in disputes involving indigenous communities' rights over land and natural resources (Bedner & Arizona, 2019). *Aliansi Masyarakat Adat Nusantara* (The Indigenous Peoples' Alliance of the Archipelago), an advocacy group representing Indonesia's indigenous communities founded in 1999, claims to be one of the world's largest movements dedicated to defending such rights (van der Muur et al., 2019).

While the general orientation of *adat* revivalism does appear to be congruent with the ideal of a pluriversal, "difference-friendly" world, in its current form, *adat* revivalism risks the possibility of failing to realize its socially transformative potential. As seen in the Minangkabau communities of West Sumatra studied by Biezeveld (2007), the revival of indigenous cultural practices has sometimes led to the return of problematic social and cultural practices based, for example, on gendered discrimination. At a broader level, one of the risks *adat* revivalism faces is the kind that Blaser (2013, 2014), himself a vocal proponent of the pluriversal paradigm from a decolonial perspective, has noted in the context of Latin American ontological politics, in the course of which some movements originally intended to defend indigenous worlds have been reduced to performances of ethnic uniqueness by the indigenous groups for strategic gains. Essentialism, even of a strategic kind employed by underrepresented groups, risks falling short of the aims of ontological politics of the pluriverse, in as much as it tends to expropriate the objects of the indigenous groups' worlds into the dominant one to win recognition within the latter. Indeed, apropos the aforementioned *Buen Vivir*, there are concerns that it has simply become another hegemonic political paradigm in Ecuador or a buzzword that accompanies vague proposals that fail to translate into concrete action and real change. For example, Benalcázar and de la Rosa (2021) point out that when the concept was taken up by the Ecuadorian constitution, its implications, such as the initiative for renewable energy supported by activists, were left ambiguous, and subsequent legislations have not signaled a radical departure from Ecuador's centralized, state-driven policy on energy.

Depending on how Indonesia's indigenous movements unfold in the coming years, there is a risk that *adat* would be made into something be tolerated or appreciated as a proof of Indonesia's cultural diversity, while government policies and industry practices in the country, by and large, continue to go on as usual. If such an outcome were actually to transpire, it would in fact not be entirely new in the history of *adat*. Although motivated by the commendable intention of understanding and preserving local traditions, the colonial-era scholarship on *adat*—the Leiden School legal scholar Cornelis van Vollenhoven (1874–1932) being the most influential figure in the earliest explorations of the notion—ended up isolating *adat* from its political and economic base, effectively relegating it "to the status of folklore" (Tyson, 2010, p. 164), an exotic "other" of the modern state.

Yet, that it does not guarantee desirable outcomes is not an argument against ontological politics per se. Rather, the contingency of its outcomes is suggestive of what makes ontological politics *political*. The interaction between different worlds—and the unavoidable operation of cultural translation between them—implies that the outcome of ontological politics cannot be entirely removed from

broader economic, social, and political conditions. That a given indigenous worldview allows for a convivial relation with more-than-humans does not entail that such a relation will actually be realized without struggle. Critique of existing practices thus has a role to play in elucidating the stakes of the antagonism between indigenous and dominant worlds so that its consequences would finally constitute a step toward the realization of the ideals that have been articulated in relation to the pluriverse.

In this vein, recent discussions on corporate social responsibility (CSR) that call for a new awareness in environmental governance are worth noting. Indonesia has adopted the ISO 26000:2010 guidance for organization social responsibility, the Act of the Republic of Indonesia Number 40 of the year 2007 on Limited Liability Companies Article 74 Concerning Social and Environmental Responsibility, and evaluates corporate commitment to sustainability programs under the Performance Rating Program (PROPER) outlined in the regulation of the Minister of State for the Environment No. 1 Year 2021 (https://proper.menlhk.go.id/), which is designed to assess and produce a ranking of companies that reflects their adherence to CSR practices toward sustainable and ethical use of natural and human resources (Kafaa, 2019). Driven largely by the aim of satisfying international standards, the Indonesian government's regulations concerning CSR have tended to replicate precisely the limitations of dominant understanding of CSR that have been pointed out by critics, particularly by those writing from postcolonial or decolonial perspectives (Banerjee, 2021; Dawkins, 2021). Broadly stated, prevailing CSR practices do not give enough consideration to the institutional voids created by the limitations of the Western theories of entrepreneurship, rendering CSR regulations unable to engage with alternative perspectives, indigenous distinctiveness, or the specificity of local contexts. While the conflict surrounding the mining operation headed by PT Freeport Indonesia in Papua has garnered perhaps the most attention because of the delicate relation between the indigenous people of Papua and the Indonesian central government (McKenna, 2015), tensions between local peoples and corporations can be seen in the various loci of Indonesia's lucrative extractive industry (Anggoro et al., 2021). It would be in line with the aims of ontological politics to introduce decolonial perspectives in CSR, so as to broaden the notions of environmental governance, sustainability, and responsibility beyond the rules of one particular world. If the calls for the recognition of the pluriverse have an ethical underpinning in a sense we have suggested, then a pluriversal ontological politics with respect to CSR may very well consist in attempts to expand the latter's purview to incorporate the preservation of indigenous worlds as one of its basic aims. Beginning to recognize, and giving expression to, the difficulties—the kind that we have highlighted earlier with reference to Lyotard's idea of *differend*—posed by the clash of different worlds would already constitute a significant first step toward an ontological politics in Indonesia.

Each clash of worlds is likely to require a different approach. A one-size-fits-all solution, after all, is antithetical to the very idea of the pluriverse. Nonetheless, whatever proposals pertaining to Indonesia put forth from a pluriversal perspective are more likely to have traction and thus real consequences if the country's

government is able to shift its own perception of, and its relation to, environmental governance, so that the idea of pluriverse comes to be accepted as its own rather than as an imposition from outside. We would thus like to close this section with a brief consideration of the sense in which the pluriverse and calls to recognize many worlds can be seen as compatible with—or even as deepening—an ideal that Indonesia already embraces as its own.

Although Indonesia has increasingly become more involved in international initiatives—such as the United Nations Framework Convention on Climate Change (UNFCCC)—in the last decade and the government has committed itself to further implementing international norms for climate mitigation, it is "still much more 'talking the talk' of climate change than 'walking the walk' of climate actions" (Höhne, 2018, p. 139). On matters of environmental policy, pressure from the international community appears to remain as one of the biggest motivators of action for Indonesia's central government. Likewise, its willingness to listen to advocates of *adat* movements may in large part be a result of its heeding to pressure coming from NGOs, both local and international. Moreover, because *Bhinneka Tunggal Ika*—and other official ideological "pillars" of Indonesia such as Pancasila and NKRI (the Unity of the Indonesian Nation)—places weight on unity at the expense of diversity, and because that ideal of unity has become at the hands of the central government a tool for its exploitation and destruction of local indigenous worlds, *adat* has been taken up most often as a counterhegemonic cause against the Indonesian state's emphasis on national unity (Avonius, 2003).

If these observations are accurate, it is not improbable for the idea of pluriversal ontological politics introduced in this chapter to be perceived by many in Indonesia (including corporate executives and policymakers) as yet another case of "foreign" paradigm, an idea imported from without Indonesia that places additional pressure on the government in matters of environmental governance. This sort of perception, in our view, is not only detrimental to realizing the ideals advocated by ontological politics but is also false. The Indonesian archipelago is *already* home to traditions of thought that are nonanthropocentric and pluriversal. To mention just a few: the Ciptagelar Kasepuhan speaks of the harmonious relation between micro- and macro-cosmos, human and nature, through notions such as *Jagat Leutik, Jagat Gede—Jagat Leutik sanubar*, and *Jagat Gede Bumi Langit* (Humaeni et al., 2018); the Javanese philosophy of life, *Memayu Hayuning Bawana*, values the maintenance of balance and peace in nature and ecological spaces, as well as the well-being of both the human and the more-than-human spiritual worlds (Ainia, 2021); within the natural philosophy of West Sumatra's Minangkabau people, according to which the relation between nature and human is founded on learning and living together, nature is not only a place but a source of learning on how to grow and die well (Azwar et al., 2018). In as much as such diverse worlds have already been unfolding across the archipleago, the pluriverse and the ontological politics to which idea is tied deserve consideration as a means of theorizing, expressing, and preserving the richness—an *ontological* richness—of Indonesia.

The richness the Indonesian archipelago harbors means that the recognition of the pluriverse and the integration of ontological politics within environmental

governance need not be regarded as "foreign" imperatives. On the contrary, they may be seen as constituting an attempt to reclaim the potential already ensconced in Indonesia's founding principles. Throughout Indonesia's modern history, the diversity of the archipelago was regarded by the central government as posing a challenge for national unity. Despite the apparent celebration of diversity by Indonesia's central government, political unity, defined and imposed as it saw fit, rarely ceased to be the priority in state policy and ideological apparatuses such as education (Bourchier, 2015). Under this condition, various indigenous conceptions of the relation between humans and nonhumans were frequently set aside as irrelevant at the level of state policy and national identity. Against this historical tendency, ontological politics can be taken up as a radicalization of *Bhinneka Tunggal Ika*, as a struggle to realize further an ideal that the modern Indonesian state has long professed to be one of its foundational principles.

2.4 Conclusion

The pluriverse continues to inspire thinkers and activists alike, not least because it paves a way to reimagine the place of humans under the condition of the Anthropocene, in which the effects of anthropogenic activities are more extensive and consequential than ever before. It seems clear that if mass-anthropogenic activities constitute the most significant cause of the threats to the livelihoods of virtually all human as well as more-than-human beings on Earth, then a response that is adequate to such planetary-scale changes would require fostering a collective awareness and concerted action at an unprecedented scale. By highlighting the need for an understanding of the world as plural and diverse, as spread across corners of the world and as unlimited by the constraints of Western rationality, the idea of the pluriverse has facilitated some of the most extensive attempts to understand and respond to the conditions of the Anthropocene. Thus, although discussions around the idea of the Anthropocene, particularly with regard to pluriversal ontological politics, are, at the moment, still an emerging discourse within environmental governance, we are convinced that they will only gain further relevance in the coming years.

Although the scholarly literature on the topic may sometimes come across as esoteric to the general reader, discussions around the pluriverse are, at bottom, motivated by a clear ethical commitment to think and elucidate the profound ramifications of the vulnerabilities that are experienced or lived differently by different groups but are nonetheless shared by all those inhabiting this planet. It is our view that Indonesia has an important role to play in matters with which theorists, activists, and inhabitants of the pluriverse have concerned themselves. Not only is Indonesia one of the major contributors to the planetary changes characteristic of the Anthropocene, given its cultural and geographical diversity, but Indonesia also has the potential to become a key site of a pluriversal ontological politics. A realization of "many worlds" in Indonesia will no doubt involve interdisciplinary and

transdisciplinary cross-sector research projects that radically reexamine the social, political, self-understanding, and ideological basis—which have often been left underexamined or taken as self-evident within domestic policy discourses—of the country. How such reexaminations should proceed is a question that shall be left open. But the first step toward the affirmation of local, indigenous worlds and reorientation of Indonesia toward issues of profound planetary significance may consist, we have suggested in this chapter, in a kind of radicalization of an ideal that Indonesia already embraces as its own, namely, the ideal of unity in diversity expressed by the country's motto, *Bhinneka Tunggal Ika*.

References

Abdullah, I. (2003). Politik Bhinneka Tunggal Ika dalam keragaman budaya Indonesia. *Jurnal Masyarakat dan Budaya, 5*(2), 1–13. https://doi.org/10.14203/jmb.v5i2.248

Ainia, D. K. (2021). Konsep metafisika dalam falsafah Jawa hamemayu hayuning bawana. *Jurnal Filsafat Indonesia, 4*(2), 195–201. https://doi.org/10.23887/jfi.v4i2.30591

Anderson, B., & Harrison, P. (2012). The promise of non-representational theories. In B. Anderson & P. Harrison (Eds.), *Taking-place: Non-representational theories and geography* (pp. 1–30). Ashgate.

Anggoro, Y., Pritasari, A., Mezaya, R., Pringgabayu, D., & Ramdlany, D. M. A. (2021). Practice of corporate social responsibility (CSR) in extractives sector in Indonesia. In *Sovereign wealth funds, local content policies and CSR* (pp. 483–497). Springer.

Avonius, L. (2003). Reforming adat: Indonesian indigenous people in the era of reformasi. *The Asia Pacific Journal of Anthropology, 4*(1–2), 123–142.

Azwar, W., Yunus, Y., Muliono, M., & Permatasari, Y. (2018). Nagari Minangkabau: The study of indigenous institutions in West Sumatra, Indonesia. *Jurnal Bina Praja: Journal of Home Affairs Governance, 10*(2), 231–239.

Banerjee, S. B. (2021). Decolonizing management theory: A critical perspective. *Journal of Management Studies*. Advance online publication. https://doi.org/10.1111/joms.12756

Bedner, A., & Arizona, Y. (2019). Adat in Indonesian land law: A promise for the future or a dead end? *The Asia Pacific Journal of Anthropology, 20*(5), 416–434. https://doi.org/10.1080/14442213.2019.1670246

Benalcázar, P. C., & de la Rosa, F. J. U. (2021). The institutionalized buen vivir: A new hegemonic political paradigm for Ecuador. *Revista Brasileira de Política Internacional, 64*(1), 1–20. https://doi.org/10.1590/0034-7329202100101

Biermann, F., Abbott, K., Andresen, S., Bäckstrand, K., Bernstein, S., Betsill, M. M., Bulkeley, H., Cashore, B., Clapp, J., Folke, C., Gupta, A., Gupta, J., Haas, P. M., Jordan, A., Kanie, N., Kluvankova-Oravska, T., Lebel, L., Liverman, D., Meadowcroft, J., et al. (2012). Navigating the Anthropocene: Improving earth system governance. *Science, 335*, 1306–1307. https://doi.org/10.1126/science.1217255

Biezeveld, R. (2007). The many roles of adat in West Sumatra. In J. S. Davidson & D. Henley (Eds.), *The revival of tradition in Indonesian politics: The deployment of adat from colonialism to indigenism* (pp. 203–223). Routledge.

Blaser, M. (2013). Ontological conflicts and the stories of peoples in spite of Europe: Toward a conversation on political ontology. *Current Anthropology, 54*(5), 547–568.

Blaser, M. (2014). Ontology and indigeneity: On the political ontology of heterogeneous assemblages. *Cultural Geographies, 21*(1), 49–58.

Bourchier, D. (2015). *Illiberal democracy in Indonesia: The ideology of the family state*. Routledge.

Braidotti, R. (2019). A theoretical framework for the critical posthumanities. *Theory, Culture & Society, 36*(6), 31–61.
Chandler, D. (2019). The transvaluation of critique in the Anthropocene. *Global Society, 33*(1), 26–44.
Chandler, D., & Reid, J. (2019). *Becoming indigenous: Governing imaginaries in the Anthropocene*. Rowman & Littlefield.
Choiruzzad, S. A. B. (2020). Anthropocentrisation and its discontents in Indonesia: Indigenous communities, non-human nature and anthropocentric political–economic governance. In J. C. Pereira & A. Saramago (Eds.), *Non-human nature in world politics* (pp. 143–161). Springer.
Clark, N., & Yusoff, K. (2017). Geosocial formations and the Anthropocene. *Theory, Culture & Society, 34*(2–3), 3–23.
Crutzen, P. J. (2016). Geology of mankind. In P. J. Crutzen & H. G. Brauch (Eds.), *Paul J. Crutzen: A pioneer on atmospheric chemistry and climate change in the Anthropocene* (pp. 211–215). Springer. https://doi.org/10.1007/978-3-319-27460-7_10
Davies, J. (2016). *The birth of the Anthropocene*. University of California Press.
Davis, H., & Turpin, E. (Eds.). (2014). *Art in the Anthropocene: Encounters among aesthetics, politics, environments and epistemologies*. Open Humanities Press.
Dawkins, C. E. (2021). Varieties of deliberation: Framing plurality in political CSR. *Business Ethics Quarterly, 32*(3), 374–403. https://doi.org/10.1017/beq.2021.28
de la Cadena, M. (2010). Indigenous cosmopolitics in the Andes: Conceptual reflections beyond "politics". *Cultural Anthropology, 25*(2), 334–370. https://doi.org/10.1111/j.1548-1360.2010.01061.x
de la Cadena, M., & Blaser, M. (Eds.). (2018). *A world of many worlds*. Duke University Press.
DeLanda, M. (2019). *A new philosophy of society: Assemblage theory and social complexity*. Bloomsbury.
Erb, M. (2007). Adat revivalism in western Flores: Culture, religion, and land. In J. S. Davidson & D. Henley (Eds.), *The revival of tradition in Indonesian politics: The deployment of adat from colonialism to indigenism* (pp. 247–274). Routledge.
Escobar, A. (2020). *Pluriversal politics*. Duke University Press.
Gelder, K., & Jacobs, J. M. (1998). *Uncanny Australia: Sacredness and identity in a postcolonial nation*. Melbourne University Publish.
Haraway, D. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making kin. *Environmental Humanities, 6*(1), 159–165.
Haraway, D., Ishikawa, N., Gilbert, S. F., Olwig, K., Tsing, A. L., & Bubandt, N. (2016). Anthropologists are talking – About the Anthropocene. *Ethnos: Journal of Anthropology, 81*(3), 535–564.
Harman, G. (2018). *Object-oriented ontology: A new theory of everything*. Pelican.
Höhne, C. (2018). From 'talking the talk' to 'walking the walk'? Multi-level global governance of the Anthropocene in Indonesia. In T. Hickmann, L. Partzsch, P. Pattberg, & S. Weiland (Eds.), *The Anthropocene debate and political science* (pp. 124–145). Routledge.
Humaeni, A., Ulumi, H. F. B., Baehaqi, W., Bahtiar, M. A., Kamaluddin, F. A., & Romi. (2018). *Budaya masyarakat kasepuhan ciptagelar Sukabumi Jawa Barat*. Laboratorium Bantenologi.
Iskandar, P. (2016). The Pancasila delusion. *Journal of Contemporary Asia, 46*(4), 723–735. https://doi.org/10.1080/00472336.2016.1195430
Kafaa, K. A. (2019). Social capital and multi-stakeholders cooperation as a foundation of corporate social responsibility. *EKUITAS (Jurnal Ekonomi Dan Keuangan), 3*(3), 365–381.
Kallis, G., Paulson, S., D'Alisa, G., & Demaria, F. (2020). *The case for degrowth*. Polity Press.
Kothari, A. (2018). Eco-swaraj vs. global eco-catastrophe. *Asia Pacific Perspectives, 15*(2), 49–54.
Kothari, A., Salleh, A., Escobar, A., Demaria, F., & Acosta, A. (2019). *Pluriverse: A post-development dictionary*. Tulika Books.
Latour, B. (2014). Agency at the time of the Anthropocene. *New Literary History, 45*(1), 1–18.

Latour, B. (2017). Anthropology at the time of the Anthropocene: A personal view of what is to be studied. In M. Brightman & J. Lewis (Eds.), *The anthropology of sustainability: Beyond development and progress* (pp. 35–49). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-56636-2_2

Lyotard, J.-F. (1989). *The differend: Phrases in dispute* (G. Van Den Abeele, Trans.). University of Minnesota Press. (Original work published in 1983)

Mahaswa, R. K., & Widhianto, A. (2020). Questioning the 'Anthropos' in the Anthropocene: Is the Anthropocene anthropocentric? *SHS Web of Conferences, 76*, 1040. https://doi.org/10.1051/shsconf/20207601040

Malhi, Y. (2017). The concept of the Anthropocene. *Annual Review of Environment and Resources, 42*(1), 77–104. https://doi.org/10.1146/annurev-environ-102016-060854

Mamani-Bernabé, V. (2015). Spirituality and the Pachamama in the Andean Aymara worldview. In F. Ricardo Rozzi, J. Stuart Chapin III, S. T. A. Pickett, M. E. Power, J. J. Armesto, & R. H. May Jr. (Eds.), *Earth stewardship* (pp. 65–76). Springer. https://doi.org/10.1007/978-3-319-12133-8_6

McKenna, K. (2015). *Corporate social responsibility and natural resource conflict*. Routledge.

Mercier, T. C. (2019). Uses of 'the pluriverse': Cosmos, interrupted – Or the others of humanities. *Ostium, 15*(2), 1–18.

Morton, T. (2013). *Hyperobjects: Philosophy and ecology after the end of the world*. University of Minnesota Press.

Nordholt, H. S., & van Klinken, G. (2007). Introduction. In H. S. Nordholt & G. van Klinken (Eds.), *Renegotiating boundaries: Local politics in post-Suharto Indonesia* (pp. 1–29). Brill.

Nyamnjoh, F. B. (2017). *Drinking from the cosmic gourd: How Amos Tutuola can change our minds*. Langaa.

O'Callaghan-Gordo, C., & Antó, J. M. (2020). COVID-19: The disease of the Anthropocene. *Environmental Research, 187*, 109683. https://doi.org/10.1016/j.envres.2020.109683

O'Shannassy, M. (2010). (Re)imagining community—Pancasila and national identity in contemporary Indonesia. In F. Dhont (Ed.), *Pancasila's contemporary appeal: Re-legitimizing Indonesia's founding ethos* (pp. 47–72). Sanata Dharma University Press.

Peredo, A. M. (2019). El Buen Vivir: Notions of wellbeing among indigenous peoples of South America. In M. Manning & C. Fleming (Eds.), *Routledge handbook of indigenous wellbeing* (pp. 156–169). Routledge. https://doi.org/10.4324/9781351051262

Querejazu, A. (2016). Encountering the pluriverse: Looking for alternatives in other worlds. *Revista Brasileira de Política Internacional, 59*(2). https://doi.org/10.1590/0034-7329201600207

Robison, R. (1996). The politics of 'Asian values'. *The Pacific Review, 9*(3), 309–327.

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The great acceleration. *Anthropocene Review, 2*(1), 81–98. https://doi.org/10.1177/2053019614564785

Tyson, A. (2010). *Decentralization and adat revivalism in Indonesia: The politics of becoming indigenous*. Routledge.

Tyson, A. (2011). Being special, becoming indigenous: Dilemmas of special adat rights in Indonesia. *Asian Journal of Social Science, 39*(5), 652–673.

Ulum, M. B., & Hamida, N. A. (2018). Revisiting liberal democracy and Asian values in contemporary Indonesia. *Constitutional Review, 4*(1), 111–130. https://doi.org/10.31078/consrev415

van Binsbergen, W. (2001). Ubuntu and the globalization of southern African thought and society. *Quest, 15*(1–2), 53–89.

van der Muur, W., Vel, J., Fisher, M. R., & Robinson, K. (2019). Changing indigeneity politics in Indonesia: From revival to projects. *The Asia Pacific Journal of Anthropology, 20*(5), 379–396.

Walsh, C. (2018). Development as buen vivir: Institutional arrangements and (de)colonial entanglements. In B. Reiter (Ed.), *Constructing the pluriverse: The geopolitics of knowledge* (pp. 184–194). Duke University Press.

Zalasiewicz, J., Waters, C. N., Williams, M., Summerhayes, C. P., Head, M. J., Leinfelder, R., Grinevald, J., McNeill, J., Oreskes, N., Steffen, W., Scott, W., Gibbard, P., Vidas, D., Hancock, T., & Barnosky, A. (2019). History and development of the Anthropocene as a stratigraphic

concept. In J. Zalasiewicz, C. N. Waters, M. Williams, & C. P. Summerhayes (Eds.), *The Anthropocene as a geological time unit: A guide to the scientific evidence and current debate* (pp. 1–40). Cambridge University Press.

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Chapter 3
Earth System Governance in Indonesia: An Initial Investigation

Erwin Nugraha, Mahesti Okitasari, Annisa Triyanti, and Yanuardi Yanuardi

Abstract Despite a growing scholarly interest internationally in the notion of earth system governance (ESG), the state-of-the-art of how the notion interacts in and with Indonesian academia has not been reviewed. The ESG notion is a paradigm that warrants the broader context of the Anthropocene and human-induced transformations of the entire earth system. Considering that Indonesia is one of the most important scholarly and empirical sites of investigation in Asia-Pacific, understanding the existing development of environmental governance with ESG can inform the corpus theory of sustainable futures. What does the notion mean in Indonesian academia? Which fields, disciplines, and networks have engaged with the notion? What are the alternative practices and directions of ESG emerging from and within the

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Indonesian academia? The chapter aims to offer an initial investigation by conducting a literature review with the following objectives: (1) to trace and evaluate the intellectual progression of the field of ESG from and within Indonesian academia, (2) to contextualize the theory and framework of ESG in the context of Indonesian academia, and (3) to identify gaps and offer reflections for future research. The chapter will review academic literature from the international database of Scopus and the Indonesian recognized national database of Garuda of the conceptual debates and discussion of ESG in the context of Indonesia. The chapter ultimately provides a summary, synthesis, and critical evaluation of the current body of knowledge about the ESG, within the broader context of environmental governance, in Indonesian academia and suggests future research.

Keywords Earth system governance · Anthropocene · Environmental governance · Literature review · Indonesia

3.1 Introduction

Despite growing scholarly interest in developing research, networks, and knowledge production with the notion of earth system governance (ESG), the state-of-the-art of how the notion interacts in and with Indonesian academia has not been reviewed. The notion of ESG is a paradigm that warrants the broader context of the Anthropocene and human-induced transformations of the entire earth system (Biermann, 2007; Burch et al., 2019). The current analysis with the "accumulation of knowledge" or "knowledge cumulation" (Newig & Rose, 2020) suggests the majority of knowledge production of ESG is produced in the global North, especially Europe and North America (Newig & Rose, 2021). Newig and Rose (2021) also indicate that even though East Asia and the Pacific region represent a significant body of knowledge production (considering the number of presentations, papers, and publication rate), they mainly originate from Australia and Japan.

Considering Indonesia is one of the most vulnerable regions in Asia-Pacific affected by climate emergency, disasters, and environmental degradation coupled with widening inequality, injustice, and weakening democracy (Dahiya & Das, 2020), an effort in evaluating the existing development of environmental governance with ESG will inform the corpus theory of sustainable development and future(s). What does the notion mean in Indonesian academia? Which fields, disciplines, and networks have engaged with the notion? What are the alternative practices and directions of ESG emerging from and within Indonesian academia?

This chapter offers an initial evaluation and reflection on the literature review and conceptual debates of ESG in the context of Indonesia and Indonesian academia. This chapter aims to present a reflective qualitative analysis with the following objectives: (1) to trace and evaluate the intellectual progression of the field of ESG from and within Indonesian academia, (2) to contextualize the theory and framework of ESG in the context of Indonesia and/or Indonesian academia, and (3) to identify

gaps and offer reflections for future research. The significance of the study is to offer an intellectual map of the interaction of ESG in the context of Indonesia and Indonesian academia and initial indications of ESG in influencing debates and knowledge production in the context of Indonesia and Indonesian academia.

The chapter reviewed academic literature from the international database of Scopus and the Indonesian recognized national database of Garuda.[1] The methodology used in this chapter is mainly based on literature review, especially looking at (combination of) general and specific keywords based on the contextual conditions and research lenses covered in the ESG framework with Indonesia as an empirical focus. The authors also used the term "environmental governance" in Indonesia to check an assumption that the concept is more familiar to Indonesian scholars. Two recognized scientific electronic databases were selected: (1) Scopus for the English language literature and (2) Garuda Portal for the literature in the Indonesian language (Bahasa Indonesia), with the search procedure combining the search terms in the titles, abstracts, and keywords. Search queries include "inequal" or "Anthropo*" or "Democra*" and "Power" or "Justice" and "Allocat*" or "Anticipat*" and "Imagina*" or "Climate change" combined with "Earth System Governance" or "Environmental Governance" or "governance" in Scopus and "Earth System Governance" or "Struktur Tata Kelola Lingkungan" or "Struktur Lingkungan" or "Politik Lingkungan" or "Antisipasi Perubahan Iklim" or "Skenario Perubahan Iklim" or "Keadilan Lingkungan" or "Transformasi Lingkungan" or "Keadilan Sumber Daya Alam" or "Transformasi Lingkungan" or "Antroposen" or "Tata Kelola Lingkungan" and "Environmental Governance" in Garuda Portal. Deductive analysis of the literature was then applied with the purpose of providing a general overview or scanning of the status of the ESG in Indonesia and/or Indonesian academia.

The authors designed the procedure with the bibliographic portfolio, which involved inclusion and exclusion criteria, to the results retrieved with the intended subject for knowledge development. Two criteria were selected: relevance to the study and availability, with no time-period limitation. Manual screening of the titles and abstracts was conducted to check the alignment with the subject of interest. On the relevance to the study, it was limited to studies addressing ESG/environmental governance and excluded, for example, articles reporting on corporate governance, which has limited relations with underlying environmental problems. The screenings yielded a total of 55 and 55 articles in Scopus and Garuda, respectively. Purposive sampling was performed for full-text analysis, selecting representative articles from each research lens and excluding remaining articles with similar topics. Whenever possible, highly cited articles were included in the review. Finally, as a result, 20 articles from each database were reviewed using the ESG framework to analyze the contextual conditions and research lenses as well as the intellectual progression of ESG in Indonesia and/or Indonesian academia.

[1] Garba Rujukan Digital, or known as Garuda Portal, is a database of 1.7 million articles collected from 2546 publishers, 13,532 journals, and 170 conferences as of January 2022, managed by Indonesian Ministry of Education, Culture, Research and Technology. The portal is accessible via https://garuda.kemdikbud.go.id/

In the following sections, the chapter provides a summary of the background and research framework with ESG focusing on the framework, specifically on contextual conditions and research lenses. It is followed by the results of the analysis on the initial indication of ESG in Indonesia and Indonesian academia. Following this, the chapter discusses the reflections, gaps, and suggestions for future research. As an initial qualitative evaluation and reflection, the chapter offers a summary, synthesis, and critical evaluation of the current body of knowledge with ESG within the broader context of environmental governance in Indonesia and Indonesian academia.

3.2 Earth System Governance in a Nutshell

The ESG project is a global initiative launched in 2009 by a global alliance of social scientists to advance understanding of the governance to address the current transition of the earth system (Biermann et al., 2009). The project defines ESG as the interrelated system of formal and informal rules, rule-making mechanisms, and actor-networks at all levels of human society (from local to global) that are set up to prevent, mitigate, and adapt to environmental change and earth system transformation (Biermann et al., 2009).

3.2.1 Research Framework

After 10 years of implementing the previous framework, since 2018, the ESG scholars have recently published new directions and reformulated the framework of earth system governance research.[2] This new ESG research framework is composed of both "the contextual conditions, which captures what is being observed, and research lenses, which offer analytical power by engaging with these conditions that fundamentally shape earth system governance scholarship" (Burch et al., 2019, p. 3). These two analytical procedures are the main analytical inquiry that this chapter will analyze when tracing and evaluating ESG from and within Indonesian academia and contextualizing ESG in the context of Indonesia and/or Indonesian academia.

3.2.2 Contextual Conditions

The new direction will be attributed to four key contextual conditions: (1) transformations, (2) inequality, (3) Anthropocene, and (4) diversity.

[2] See https://www.earthsystemgovernance.org/people/new-directions/

Transformations Burch et al. (2019, p. 3) define transformations as "shifts that involve fundamental changes in structural, functional, relational and cognitive dimensions of linked socio-technical-ecological systems." The study of transformations can be approached in several ways: analytically, normatively, or critically (Burch et al., 2019). Crucially, transformations imply changes in power relations. The new research directions recommend three different angles to comprehend the role of governance concerning sustainability transformation: governance for transformation, governance of transformation, and transformation in governance (Burch et al., 2019).

Inequality The new direction of ESG argues that the increasing and multifaceted inequalities across and within countries and socio-economic groups result from unjust procedural and distributive justice systems at multilevel governance. The research challenge is to discover "how inequality is embedded in the complex interactions of governance (actors, sectors, interests, forums, scales, technologies, etc.); within unpredictable natural systems; and in the context of competing economic (Ehresman & Okereke, 2015) and political pressures to allocate limited resources" (Burch et al., 2019, p. 5). Additionally, the new direction recommends developing studies "to understand how structural inequalities, power imbalances and intersecting axes of privilege and marginalization shape vulnerabilities to global environmental change and, in turn, are shaped by them" (Burch et al., 2019, p. 5).

Anthropocene Burch et al. (2019) support the notion that human activity has rapidly transformed the earth system from Holocene to the Anthropocene epoch since the "Great Acceleration" post-World War II era. This change considerably requires understanding not only about environmental governance in general but specifically about earth system governance. The Anthropocene involves three fundamental challenges for earth system governance research: urgency, responsibility, and complexity. These three research challenges are common issues to environmental governance but have become particularly globally intensifying under the conditions of the Anthropocene (Burch et al., 2019).

Diversity The new research directions emphasize considering that "the different directions in which societies can be steered result from power struggles and diversity in worldviews, knowledge systems, values and norms, and ecosystems" (Burch et al., 2019, p. 6). The diversity in norms and knowledge systems can be viewed in two opposite ways, an asset or a danger for just and ecologically sound governance. Thus, participation of different actors with norms, worldviews, and knowledge systems diverse in governance processes is prominent. The challenge is how to create and maintain decision-making processes that are at the same time inclusive and efficient. Thus, further research needs to "analyze, theorize, and criticize how diversity affects earth system governance practice" (Burch et al., 2019, p. 6).

3.2.3 Research Lenses

The new direction of the ESG research framework consists of five sets of interconnected research lenses: (1) architecture and agency, (2) democracy and power, (3) justice and allocation, (4) anticipation and imagination, and (5) adaptiveness and reflexivity.

Architecture and Agency This research lens aims to understand the institutional frameworks and actors implicated in earth system governance and how these institutions and actors resist or respond to change and evolve (Burch et al., 2019). Based on Biermann et al. (2009, p. 31), governance architecture is defined as "the interlocking web of widely shared principles, institutions and practices that shape decisions at all levels in a given area of earth system governance." Three prominent themes are fragmentation, complexity, and polycentricity. Meanwhile, agency refers to the capacity of public actors and nonstate actors (at local, national, and international levels) to respond to global change and how actors' capacity may be changing in responding to new governance demands created by earth system transformation (Biermann, 2007). Burch et al. (2019) recommend studies on the interplay between architecture and agency to comprehend institutional dynamics, relationships, and change in governance systems.

Democracy and Power Burch et al. (2019, p. 9) believe that democracy promises peaceful means to distribute "political power among citizens and transfer power to their representatives and a means of curtailing the arbitrary exercise of power." Democracy can be understood as a quality of state institutions and as extended to nonstate actors and hybrid forms of governance at local, national, and global levels (Burch et al., 2019). Research on intersections between global, national, and local democracy is necessary because the legitimacy of national representatives in multilateralism depends on the legitimacy of domestic processes for forming collective preferences. Additionally, the relationship between democracy and sustainability has been a focal theme of environmental–political theory amidst the resurgence of populism and authoritarianism, often with anti-environmental views (Burch et al., 2019). It is urgent for "future research in earth system governance to examine whether new conceptions of democracy and power can help make sense of and craft responses" to these circumstances (Burch et al., 2019, p. 8).

Based on Barnett and Duvall (2005, p. 42), power is defined as the "production, in and through social relations, of effects that shape the capacities of actors to determine their circumstances and fate." Research focus on power is required to illuminate how different forms of unequal power are generated and sustained in institutions for global environmental governance. This research focus raises plentiful new research questions, including: "How can interlinkages between accountability, legitimacy, and transparency as key qualities of governance arrangements be conceptualized and realized? Under what conditions does transparency contribute to more accountable and legitimate earth system governance?" (Burch et al., 2019, p. 9).

Justice and Allocation Burch et al. (2019) urgently recommend constructing a systematic analytical, philosophical, and empirical investigation on justice, and its core allocation demand, as it becomes crucial political and social concern. Hence, they consider conceptualizing justice in three dimensions: intergenerational (between generations), international (between states and regions), and intersectional (between groups/categories in society) (Jerneck et al., 2011, see in Burch et al., 2018, p. 61). For ESG, the institutions responsible for distributing such costs and benefits across different generations, nation-states, and different groups in global societies are paramount for achieving justice as allocation. Scholars contend that two other elements are essential to materialize justice as allocation: recognition and representation (Fraser, 2001, see in Burch et al., 2019).

According to Burch et al. (2019), the interplays between justice and allocation research lenses might ignite studies on "what governance types may effectively and ineffectively channel personal, regional, national and global world views towards more sustainable approaches to environmental rights and obligations? What kind of identified trade-offs may occur between the different dimensions of justice and allocation?" (Burch et al., 2019, p. 11).

Anticipation and Imagination The new ESG research directions envisage studies on anticipation and imagination as vital for examining "how to govern … diverse anticipation processes" and "scrutinize how anticipation itself becomes a site of politics and governance" at multiple levels (Burch et al., 2018, p. 61). Based on Gupta (2001, 2011) and Guston (2010), Burch et al. (2019, p. 11) define anticipatory governance as "the evolution of steering mechanisms in the present to govern future earth system transformations in the face of extreme normative and scientific uncertainty and conflict over the very existence, nature and distributive implications of such transformations." Scholars refer to the imagination as an essential means of governance that addresses challenges that appear to be barely solvable using traditional modes of decision-making (Rittel & Webber, 1973; see in Burch et al., 2019, p. 12).

Burch et al. (2019) propose further research on anticipating and imagining diverse futures through modeling, integrated assessments, foresight, and scenario building. An essential research niche is to analyze "how processes of anticipation relating to environmental transformations are themselves being governed, i.e. who is steering them, to what end, and through what deliberative or representative processes" (Burch et al., 2019, p. 12).

Adaptiveness and Reflexivity Burch et al. (2019) envisage studies on adaptiveness and reflexivity are paramount for understanding how societies can navigate change toward global sustainability. According to Biermann et al. (2009, p. 45), adaptiveness refers to "changes made by social groups in response to, or in anticipation of, challenges created through environmental change." Burch et al. (2019) refer to Dryzek (2016), who mentioned ecological reflexivity as "a critical competence for reshaping institutions in the Anthropocene" that consisted of two orders: "first order reflexivity (whereby institutions generate effects that feedback on themselves)

and second-order reflexivity (whereby institutions build a capacity to critically scrutinize their own practices)" (Voß & Kemp, 2006, pp. 6–7). Moreover, the scholars recommend three future research topics related to the nexus of adaptiveness and reflexivity: navigating tensions between stability and flexibility (Biermann, 2007, p. 331), addressing globally networked risks, and reshaping governance systems at all scales within the Anthropocene (Burch et al., 2019, p. 13).

3.3 Early Indications and Development of Earth System Governance in Indonesia

This section informs the detailed context of the study and explains the results of the analysis, with two objectives: (1) to trace and evaluate the intellectual progression of the field of ESG from and within Indonesian academia (country of origins, affiliation, type of article, type of questions and methodology) and (2) to contextualize the theory and framework of ESG in the context of Indonesia and/or Indonesian academia (from four contextual conditions and five research lenses).

3.3.1 Early Indications of ESG Intellectual Progression

The initial analysis with the trace and intellectual progression of ESG from and within Indonesia is shown in Table 3.1. The authors identified that the dominant type of article covered in the Scopus database is a combination of conceptual and empirical papers that are aimed at evaluating certain governance qualities, while in Garuda Portal, they are more diverse. Furthermore, research published in Garuda Portal mainly addresses the type of question on governance through a descriptive approach. The dominant method employed in papers published both in international journals in Scopus and Indonesian journals in Garuda Portal on ESG in Indonesia is mainly the qualitative method. Furthermore, the authors also found that researchers who published articles in international journals in Scopus on ESG and Indonesia are mostly affiliated with institutions outside of Indonesia. While on the opposite, the state-of-the-art of knowledge on ESG in Indonesia is dominated by the university network affiliated to some extent within the outreach of the ESG network.

3.3.2 Contextual Conditions

In this section, the way contextual conditions of ESG are perceived in the existing literature from both Scopus and Garuda Portal databases was analyzed. Four ESG contextual conditions are explained below: transformation, inequality, Anthropocene, and diversity.

Table 3.1 The landscape of early indications of ESG research

	Scopus	Garuda portal
Number of articles	20	20
Country of origin of the first author	Indonesia: 1 Others: 19	Indonesia: 19 Others: 1
Type of affiliation of the first author	University: 17 Other institutions: 3	University: 19 Other institutions: 1
Type of article	Combination of empirical and conceptual: 18 Combination of conceptual and literature review: 2	Empirical: 7 Combination of methodological and conceptual: 1 Literature review: 6 Agenda-setting: 2 Perspective: 8
Type of questions on governance	Evaluation: 8 Descriptive: 12	Descriptive: 20
Methodology	Qualitative: 19 Mixed: 1	Qualitative: 13 Mixed: 1 Theoretical: 4

Transformations Transformations were generally mentioned to contextualize, describe, and explain approaches relevant to the study the authors were reporting on (Dharmawan, 2007; Putri et al., 2013). This includes local environmental governance, community-based environmental management, and socio-human-ecology approach. In one article, the authors attempted to juxtapose the ESG concept in the education sector (Wulandari et al., 2019). The term transformations is described as both a driver of and response to environmental governance challenges in Indonesia. For example, socio-economic transformation as a driver is explained in the case of expansion of mining, which causes resources conflict between mining and forest sector in East Kalimantan (Thaler & Anandi, 2017) and land grabbing in Kapuas River, which transforms the area "from a space of life and livelihood to one of illness and ecological collapse" (Pye et al., 2017, p. 378). As a response to these types of anthropogenic transformations, the effort to deal with the problems should also be transformative. A case in point is the intensified flood hazards in Jakarta, which need "deeper societal debate" to define the desired flood risk reduction pathways combined with development planning. It may require transformative actions such as a planned retreat strategy (Garschagen et al., 2018). In general, there is a lack of in-depth attention to fundamental changes related to the combination of socio-technical-ecological systems defined by transformations in ESG. Most articles approached the concept in a normative way and less analytically nor critically. Specific to findings from the Indonesian Garuda database, the role of governance in sustainable transformations from multiple angles remains underexplored and underdeveloped.

Inequality Based on the existing literature from both the Indonesian Garuda Portal and the International Scopus databases, inequality is perceived as a contextual, underlying condition that exacerbates environmental governance problems in

Indonesia. Since the decentralization era, inequality problems became more accentuated, local governmental capacity was reduced, which faltered the delivery of local government services (Butler et al., 2014). Many underlying inequality problems are related to poverty and unequal distribution of benefits to the disadvantaged, including women, land-less, and poor female-headed families (Butler et al., 2014). The issue of inequality is prominent, especially in the case of natural resources management, inherited by the socio-cultural and political system in Indonesia. In articles retrieved from Garuda Portal, there is a distinctive legal perspective in approaching and contextualizing inequality issues. These articles generally characterize inequality as a product of unjust procedural and distributional justice. For example, environmental inequality is deemed as a result of impartial and lack of transparency in legal processes and contradictory forces and outcomes of national and local politics (Pigome, 2011). The majority of articles addressed inequality in terms of unequal access to resources and unequal share of burdens from environmental harms, especially looking at local communities (Aguw, 2013; Harahap, 2018).

Anthropocene Furthermore, the concept of Anthropocene is fairly new and has not been frequently utilized in the current literature, especially specific to the Indonesian case. In general, there is a lack of multifaceted discussion and empirical research that contextualizes the main challenges of environmental governance under the conditions of the Anthropocene as well as links them with potential dilemmas aside from justice, such as democracy and institutional reforms. To some extent, there is awareness of the concept among scholars working on the case of Indonesia, but they are limited. One of the examined articles discusses the concept of Anthropocene from the lens of climate change, in which the paper highlights the positionality of Indonesia as one of the largest emitters of greenhouse gas and therefore driving the Anthropocene (Höhne et al., 2018). Through our search within the Indonesian Garuda Portal, although the term Anthropocene is not literally adopted, some studies have touched upon the potential conflicts between the political-economic system in Indonesia and the transformation embodied by the Anthropocene, for example, the existing application of socio-ecological approaches in environmental governance, such as the green and blue economy (Purwendah et al., 2020).

Diversity Diversity is interpreted in different ways in the literature. It relates not only to the diversity of systems (social, ecological, economic, cultural, and institutional) but also to responses to deal with environmental problems. Observed articles present prominence to diversity from the perspective of desired governance strategies that influence outcomes, particularly on the inclusiveness of actors, knowledge, and traditional values that are often excluded (Guarnacci, 2012; Kubo et al., 2019; Syafi'i, 2018). There is a need for more empirical research that identifies, understands, and contextualizes normative diversity in different ecological contexts. Notably missing is an emphasis on diversity from an ontological standpoint, including embracing diversity as a more nuanced approach outside of social diversity.

3.3.3 Research Lenses

The ESG research lenses comprise five lenses: architecture and agency, democracy and power, justice and allocation, anticipation and imagination, and adaptiveness and reflexivity. This section outlines how observed papers from Scopus and Garuda Portal utilized these research lenses.

Architecture and Agency Across observed articles from Garuda Portal and Scopus on architecture and agency, hierarchical systems characterized governance modes and legal systems. In articles addressing newly decentralized countries, authors have pointed out the issue of fragmentation and capacity (Kubo et al., 2019), for example, inadequate and inappropriate legal framework and institutional arrangement (Sahri et al., 2020) and legal disconnects due to decentralization of resource management and its implementation (Kusumawati & Visser, 2014). Findings also suggest that new actors are introduced into governance systems, including nongovernmental organizations (NGOs), international organizations, grassroots communities, and youth. This does not necessarily lead to more research focusing on architecture and agency. In practice, instead of focusing on architecture, more emphasis is given to discussing the agency, particularly of those nonstate actors in influencing environmental decision-making processes, such as NGOs (Wibisana, 2017) and youth (Astuti, 2019). Moreover, despite the fragmented and complex system currently in place identified as one of the major issues in governing the environment in Indonesia and increasing participation of new actors, the authors noted a lack of discussion on polycentricity on the governance systems.

Democracy and Power Articles analyzing the environmental governance from democracy and power uncovered the strong influence from the local elites that is prevalent in Indonesia. Some of those articles identify the increasing effort of democratization permeating the environmental governance system. It is worth noting that from the Garuda Portal database, several articles have utilized democracy and power lens to describe empirically the struggles between democracy and sustainability, particularly on public involvement in environmental decision-making (Putri et al., 2013; Kamim, 2017; Astuti, 2019). There is consensus among these articles that public participation, especially among those who are often marginalized, such as the community, is key to improving the quality of decisions by harnessing the knowledge of communities. Meanwhile, in the Scopus database, several articles have also discussed democracy and power. In general, the concept is well accepted but hard to implement in the case of environmental governance. A case in point is the study conducted by Kooy and Walter (2019) on urban drinking water supply in Jakarta, the capital city of Indonesia. Through the lens of political ecology, the paper concluded that the regional trend for privileging large capital, foreign firms, and cronies while maintaining a tightly controlled, top-down style of governance is a major hurdle for broadening the distribution of growth and opportunity, especially in the water sector. The argument was also supported by Rahayu et al. (2019) through a study in the same sector, urban water governance. They revealed

that significant inequality and unilateral control of water resources are inherited from a strong authoritarian, centralized government political culture.

Justice and Allocation Justice and allocation are quite common in the observed articles from the Garuda Portal database, especially from the perspective of corrective (Wibisana, 2017; Said & Nurhayati, 2020) and procedural justice (Aguw, 2013; Sagama, 2016). Across both databases, findings suggest that the discussion on justice in Indonesia is more focused on the legal culture, such as democratic and responsive legal politics and legal norms, rather than the overall systemic analysis of justice and allocation practices. Allocation and access complexity are associated with power relations within the hierarchical systems, implying the challenges facing equitable redistribution of power prevalent in the country (McCarthy, 2014), especially at the local level (Djalante, 2012). Observed articles also point out that the conflicting views of the role and domination of the state and the ecological justice system are nuanced in the context of the Indonesian legal system, which affects the fair compensation of environmental damage (Purwendah et al., 2020). Existing studies have attempted to explore the complex interactions and dynamics of a resource through what is considered legitimate and fair by users, for example, in the case of outsider small-scale fishers' access to Berau waters, which is legal based on the national law. However, it is seen as "illegitimate and illicit" by the local fishers' community and the international NGO that aims to create marine conservation areas and curb the overexploitation of fish in Berau coastal areas (Gunawan & Visser, 2012). Conflicting and contradicting perspectives on international, intergenerational, and intersectional dimensions still appear to have little influence on the research environment in Indonesia. Among the analyzed articles, one article examines how public–private partnerships can play an essential role in implementing intergenerational equity (Wibisana, 2017).

Anticipation and Imagination There is a lack of studies foregrounding anticipation and imagination in Scopus databases. Some studies under the topic of climate change discussed only on a theoretical level or related them with anticipation and imagination to respond to physical system dynamics. None of the observed articles retrieved from Garuda Portal use anticipation and imagination as a research lens.

Adaptiveness and Reflexivity Concerning adaptiveness and reflexivity, there is a similar state of lacking studies, especially those focusing on reflexivity. Among available articles using the adaptiveness perspective, they are discussed to some extent under climate change and disaster risk reduction topics. This is despite abundant research focusing on climate change adaptation. Adaptiveness is also generally studied from the social learning angle, such as integrating community-based environmental management into early childhood education (Wulandari et al., 2019). Moreover, in Indonesia, especially in the case of disaster risk reduction, adaptive capacity improvement seems to be driven by nongovernment organizations. These organizations have been involved in various pressing issues such as poverty alleviation, environmental management, gender strengthening, and governance. These

experiences equip organizations to be flexible yet robust enough to respond to changes and uncertainties. Interviews with these organizations revealed strong collaboration and coordination at the local and national levels (Djalante, 2012). In forest management, the use of adaptive management is highlighted to increase effective forest governance, which requires flexible and multiple policy approaches (Kubo et al., 2019). Maladaptation and critical scrutiny of prevailing values and practices remain underexplored topics, along with studies on the reflexivity of Indonesian environmental governing systems.

3.4 Reflections, Gaps, and Future Research Agenda

In the previous section, the authors have traced and evaluated the intellectual progression of the field of ESG from and within Indonesian academia as well as contextualized the theory and framework of ESG in the context of Indonesia and/or Indonesian academia. This section, thus, focuses on how these initial investigations and findings reflect and offer implicit insights for current research and policy in Indonesia and/or Indonesian academia as well as future research agenda. Two key areas are highlighted on reflections and gaps of ESG and further outline future research agenda to inform scholars, academia, practitioners, and policymakers working across the field. This is particularly critical to recognize the importance and dynamics of how ESG interacts, intertwines, or is in conversation with scholars working in Indonesia and/or Indonesian academia to revisit and reorient environmental governance in Indonesia.

In terms of reflection and gaps from ESG, this chapter discusses these from the perspective of knowledge production, our positionality as researchers working on ESG and international actors to influence the ESG debates and development in Indonesia as well as the progress of the field from Indonesia and/or Indonesian academia. *First*, the authors recognize that the cumulative knowledge of ESG is currently widely imbalanced and produced mainly by international scholars. While Indonesian scholars started to engage with both the contextual conditions and research lens of ESG, they have yet further asked how knowledge is produced, who set up the research agenda and how networks developed. A clear example of the term Anthropocene and how it is “translated” has not been embedded within Indonesian academia to inform its application and context. *Second*, the authorship positionality as scholars working across the field of ESG, from justice, water governance, and sustainable development to climate change adaptation, who are based in the Global North institutions or research centers, necessitates further investigation. There are at least eight Indonesian scholars[3] who have ties with the ESG network and engage either as research fellows or in the working groups, but how these

[3]These eight Indonesian scholars with ties to the ESG network are Riyanti Djalante, Jonatan A. Lassa, Erwin Nugraha, Mahesti Okitasari, Abidah Setyowati, Annisa Triyanti, Ahmad Rizki Mardhatillah Umar, and Yanuardi Yanuardi.

scholars work and interact with Indonesian academia will require more in-depth research. These gaps include how training and capacity development are available and expand beyond the current scholars, and the connection is made and maintained between Indonesian scholars who are based in the global and national or local level. *Third*, there are significant gaps in the current ESG debate and discussion, mainly informed by environmental policy or management instead of environmental governance; for example, lack of debate on the combination of socio-technical-ecological systems in transformations or a narrow focus on inequality on unequal access to resources. With regard to public participation in environmental governance, there is a significant observation of "pseudo"-participation, which is mainly procedural without deepening reflection and tends to be centered around centralized control.

The authors also want to emphasize scholars, academia, practitioners, and policymakers concerning ESG with further research agenda and invite them to reiterate the importance and significance of realizing this research agenda in order to foreground ESG in a more diverse, in-depth, and critical manner to inform policy and practice. However, the authors are aware that this chapter is an initial investigation of the field and does not cover the whole landscape of the field and literature, and they want to highlight the agenda as potential future work. *First*, the authors encourage expanding the "accumulation of knowledge" (Newig & Rose, 2020, 2021) to be more representative and engage in inclusive co-production of knowledge. This agenda would mean re-thinking the "co" as reflected by Howarth et al. (2022), in producing ESG knowledge to inform and influence environmental governance in Indonesia and Indonesian academia and create an equal global partnership in research and policy development. *Second*, the authors invite more critical knowledge production and production of indigenous knowledge and representation, for example, storytelling, narrative, and everyday life. This agenda is also to reiterate our attendance and focus on societal transformations and inter−/transdisciplinary research, especially concerning Indonesia's current state of progress, that to a certain extent, shifting from decentralization to re-centralization in environmental governance across different sectors (forest, natural resources, disaster). It is to inform more critical research toward ontological, epistemological, and critical ways of knowing ESG in Indonesia and/or Indonesian academia, for example, lack of understanding with diversity, justice and allocation, anticipation and imagination, and adaptiveness and reflexivity. *Third*, the authors suggest paying more attention to future thinking by exploring the concept of the Anthropocene as a contextual condition and incorporating anticipatory and transformative types of governance approaches as research lenses for the ESG framework and the environmental governance field. These are important concepts and lenses to deal with more complex and uncertain earth systems and environmental challenges in the future. *Fourth,* the authors suggest galvanizing connection, network, and research partnerships across the ESG community to shape and create equal and inclusive research settings and implementation. Engagement with ESG Asia Pacific Working Group is an important channel to facilitate this process to bridge the science–policy–practice to Indonesian research communities and vice versa, for example, U-INSPIRE Indonesia, Resilience Development Initiative, and Universitas Negeri Yogyakarta.

Finally, seeing these research agendas materialize in expanding research in ESG and/or informing research in environmental governance in Indonesia and Indonesian academia would be a significant step to further advance the field toward a just and inclusive planetary future.

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References

Aguw, Y. O. (2013). Pengaturan pemanfaatan sumber daya alam laut dan pesisir berbasis penegakan hukum dan keadilan. *Lex et Societatis, 1*(5), 144–153.

Astuti, R. (2019). Keadilan inter-generasi, malapetaka lingkungan, dan pemuda di era Antroposen. *Jurnal Studi Pemuda, 8*(2), 167–173. https://doi.org/10.22146/studipemudaugm.48576

Barnett, M., & Duvall, R. (2005). Power in international politics. *International Organisation, 59*(1), 39–75. https://doi.org/10.1017/S0020818305050010

Biermann, F. (2007). 'Earth System Governance' as a crosscutting theme for a global research. *Global Environmental Change, 17*, 326–337. https://doi.org/10.1016/j.gloenvcha.2006.11.010

Biermann, F., Betsill, M. M., Gupta, J., Kanie, N., Lebel, L., Liverman, D., Schroeder, H., & Siebenhüner, B. (2009). *Earth system governance project people, places, and the planet: Science and implementation plan of the Earth system governance project* (Earth system governance project report no.1, IHDP report no. 20). Retrieved February 4, 2022, from https://www.earthsystemgovernance.org/wp-content/uploads/2010/03/Biermann-et-al.-2009-Earth-System-Governance-People-Places-and-the-Planet.-Science-and-Implementation-Plan-of-the-Earth-System-Gove.pdf

Burch, S., Gupta, A., Inoue, C. Y. A., Kalfagianni, A., & Persson, Å. (2018). *Earth system governance: Science and implementation plan of the earth system governance project*. Earth System Governance, Utrecht, the Netherlands.

Burch, S., Gupta, A., Inoue, C. Y. A., Kalfagianni, A., Persson, A., Gerlak, A. K., Ishii, A., Patterson, J., Pickering, J., Scobie, M., Van der Heijden, J., Vervoort, J., Adler, C., Bloomfield, M., Djalante, R., Dryzek, J., Galaz, V., Gordon, C., Harmon, R., et al. (2019). New directions in earth system governance research. *Earth System Governance, 1*, 100006. https://doi.org/10.1016/j.esg.2019.100006

Butler, J. R. A., Suadnya, W., Puspadi, K., Sutaryono, Y., Wise, R. M., Skewes, T. D., Kirono, D., Bohensky, E. L., Handayani, T., Habibi, P., Kisman, M., Suharto, I., Hanartani, S., Supartarningsih, S., Ripaldi, A., Fachry, A., Yanuartati, Y., Abbas, G., & Ash, A. (2014). Framing the application of adaptation pathways for rural livelihoods and global change in eastern Indonesian islands. *Global Environmental Change, 28*, 368–382. https://doi.org/10.1016/j.gloenvcha.2013.12.004

Dahiya, B., & Das, A. (2020). New urban agenda in Asia-Pacific: Governance for sustainable and inclusive cities. In B. Dahiya & A. Das (Eds.), *New urban agenda in Asia-Pacific* (pp. 3–36). Springer.

Dharmawan, A. H. (2007). Dinamika sosio-ekologi pedesaan: Perspektif dan pertautan keilmuan ekologi manusia, sosiologi lingkungan dan ekologi politik. *Sodality: Jurnal Transdisiplin Sosiologi, Komunikasi, dan Ekologi Manusia, 1*(1), 1–40.

Djalante, R. (2012). Adaptive governance and resilience: The role of multi-stakeholder platforms in disaster risk reduction. *Natural Hazards and Earth System Sciences, 12*(9), 2923–2942. https://doi.org/10.5194/nhess-12-2923-2012

Dryzek, J. S. (2016). Institutions for the Anthropocene: Governance in a changing earth system. *British Journal of Political Science, 46*(4), 937–956. https://doi.org/10.1017/S0007123414000453

Ehresman, T., & Okereke, C. (2015). Environmental justice and conceptions of the green economy. *International Environmental Agreements: Politics, Law and Economics, 15*(1), 13–27. https://doi.org/10.1007/s10784-014-9265-2

Fraser, N. (2001). Recognition without ethics? *Theory, Culture & Society., 18*, 21–42. https://doi.org/10.1177/02632760122051760

Garschagen, M., Surtiari, G. A. K., & Harb, M. (2018). Is Jakarta's new flood risk reduction strategy transformational? *Sustainability, 10*(8), 2934. https://doi.org/10.3390/su10082934

Guarnacci, U. (2012). Governance for sustainable reconstruction after disasters: Lessons from Nias, Indonesia. *Environmental Development, 2*(1), 73–85. https://doi.org/10.1016/j.envdev.2012.03.010

Gunawan, B. I., & Visser, L. E. (2012). Permeable boundaries: Outsiders and access to fishing grounds in the Berau marine protected area. *Anthropological Forum, 22*(2), 187–207. https://doi.org/10.1080/00664677.2012.694173

Gupta, A. (2001). *Searching for shared norms: Global anticipatory governance of biosafety*. Unpublished doctoral dissertation, Yale University, Graduate School of Arts and Sciences.

Gupta, A. (2011). An evolving science-society contract in India: The search for legitimacy in anticipatory risk governance. *Food Policy, 36*, 736–741. https://doi.org/10.1016/j.foodpol.2011.07.011

Guston, D. (2010). The anticipatory governance of emerging technologies. *Journal of the Korean Vacuum Society, 19*, 432–441. https://doi.org/10.5757/JKVS.2010.19.6.432

Harahap, H. I. (2018). Peluang masyarakat pesisir di kampung nelayan dalam upaya meningkatkan kemandirian ekonomi melalui pendekatan politik lingkungan. *Jurnal Masyarakat Mandiri, 2*(2), 143–148. https://doi.org/10.31764/jmm.v0i0.1347

Höhne, C., Fuhr, H., Hickmann, T., Ledere, M., & Stehle, F. (2018). REDD+ and the reconfiguration of public authority in the forest sector: A comparative case study of Indonesia and Brazil. In E. O. Nuesiri (Ed.), *Global forest governance and climate change* (Palgrave studies in natural resource management) (pp. 203–241). Palgrave Macmillan. Available from: https://doi.org/10.1007/978-3-319-71946-7_8

Howarth, C., Lane, M., Morse-Jones, S., Brooks, K., & Viner, D. (2022). The 'co' in co-production of climate action: Challenging boundaries with and between science, policy and practice. *Global Environmental Change, 72*, 102445. https://doi.org/10.1016/j.gloenvcha.2021.102445

Jerneck, A., Olsson, L., Ness, B., Anderberg, S., Baier, M., Clark, E., Hickler, T., Hornborg, A., Kronsell, A., Lövbrand, E., & Persson, J. (2011). Structuring sustainability science. *Sustainability Science, 6*(1), 69–82. https://doi.org/10.1007/s11625-010-0117-x

Kamim, A. B. M. (2017). Perwujudan sistem politik intrakomunitas dan sinergi pengelolaan lingkungan: Studi kasus bank sampah *Gardu Action*, Mancingan XI, Parangtritis, Bantul. *Political, 8*(1), 20–37.

Kooy, M., & Walter, C. T. (2019). Towards a situated urban political ecology analysis of packaged drinking water supply. *Water, 11*(2), 225. https://doi.org/10.3390/w11020225

Kubo, H., Wibawanto, A., & Rossanda, D. (2019). Toward a policy mix in conservation governance: A case of Gunung Palung National Park, West Kalimantan, Indonesia. *Land Use Policy, 88*, 104108. https://doi.org/10.1016/j.landusepol.2019.104108

Kusumawati, R., & Visser, L. E. (2014). Collaboration or contention? Decentralized marine governance in Berau. *Anthropological Forum, 24*(1), 21–46. https://doi.org/10.1080/00664677.2014.868783

McCarthy, S. (2014). Norm diffusion and the limits to forestry governance reform in Southeast Asia's new democracies. *Pacific Review, 27*(5), 755–778. https://doi.org/10.1080/09512748.2014.948565

Newig, J., & Rose, M. (2020). Cumulating evidence in environmental governance, policy and planning research: Towards a research reform agenda. *Journal Environmental Policy & Planning, 22*(5), 667–681. https://doi.org/10.1080/1523908X.2020.1767551

Newig, J., & Rose, M. (2021). *Evidence-orientation in earth system governance research*. Presentation at 2021 Bratislava conference earth system governance, Panel ID 509 Inter-/transdisciplinary and reflexivity in research, Thursday, 9 Sept 2021.

Pigome, M. (2011). Politik hukum pertambangan Indonesia dan pengaruhnya pada pengelolaan lingkungan hidup di era otonomi daerah. *Masalah-Masalah Hukum, 40*(2), 215–219.

Purwendah, E. K., Djatmiko, A., & Pudyastiwi, E. (2020). Keadilan ekologi dan keadilan sosial sebagai dasar perlindungan dan pelestarian lingkungan laut dalam sistem hukum Indonesia. *Jurnal Pendidikan Kewarganegaraan Undiksha, 8*(2), 1–14.

Putri, C. D., Mindarti, L. I., & Nurani, F. (2013). Peran pemerintah daerah dalam mengelola ruang terbuka hijau dengan perspektif good environmental governance (studi di kota Madiun). *Jurnal Administrasi Publik (JAP), 1*(3), 42–50.

Pye, O., Radjawali, I., & Julia. (2017). Land grabs and the river: Eco-social transformations along the Kapuas, Indonesia. *Canadian Journal of Development Studies, 38*(3), 378–394. https://doi.org/10.1080/02255189.2017.1298518

Rahayu, P., Woltjer, J., & Firman, T. (2019). Water governance in decentralizing urban Indonesia. *Urban Studies, 56*(14), 2917–2934. https://doi.org/10.1177/0042098018810306

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*, 155–169. https://doi.org/10.1007/BF01405730

Sagama, S. (2016). Analisis konsep keadilan, kepastian hukum dan kemanfaatan dalam pengelolaan lingkungan. *Mazahib, 15*(1), 20–41. https://doi.org/10.21093/mj.v15i1.590

Sahri, A., Mustika, P. L. K., Dewanto, H. Y., & Murk, A. J. (2020). A critical review of marine mammal governance and protection in Indonesia. *Marine Policy, 117*, 1038893. https://doi.org/10.1016/j.marpol.2020.103893

Said, M. Y., & Nurhayati, Y. (2020). Paradigma filsafat etika lingkungan dalam menentukan arah politik hukum lingkungan. *Al'Adl, 12*(1), 39–60. https://doi.org/10.31602/al-adl.v12i1.2598

Syafi'i, M. (2018). Peranan masyarakat adat petalangan dalam mengamalkan nilai struktur adat berbasis kearifan lokal lingkungan. *Dinamika Lingkungan Indonesia, 5*(2), 97–207.

Thaler, G. M., & Anandi, C. A. M. (2017). Shifting cultivation, contentious land change and forest governance: The politics of swidden in East Kalimantan. *Journal of Peasant Studies, 44*(4), 791–812. https://doi.org/10.1080/03066150.2016.1243531

Voß, J.-P., & Kemp, R. (2006). Sustainability and reflexive governance: Introduction. In J.-P. Voß, D. Bauknecht, & R. Kemp (Eds.), *Reflexive governance for sustainable development* (pp. 3–28). Edward Elgar.

Wibisana, A. G. (2017). Keadilan dalam satu (intra) generasi: Sebuah pengantar berdasarkan taksonomi keadilan sosial. *Mimbar Hukum, 29*(2), 292–307. https://doi.org/10.22146/jmh.19143

Wulandari, Y. P., Putri, N. S., & Farahdita, D. (2019). Transformasi peran PAUD sebagai pendekatan pengelolaan lingkungan hidup berbasis masyarakat. *Jurnal CARE, 4*(1), 11–22.

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Chapter 4
Post-politicizing the Environment: Local Government Performance Assessments in Indonesia

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Abstract Indonesia is confronting an intensifying threat of ecological disaster due to excessive natural resource exploitation and environmental damage. Existing tools to evaluate local government performance are unable to critically assess many key aspects of natural resource and environmental management. The results of these formal performance assessments do not reflect the reality in local communities. We argue that this gap is caused by more than just inaccurate reporting; the gap between reality and assessment results is because official assessment approaches sideline the consideration of state–society relations and socio-political dimensions. The assessments reduce natural resource management and environmental protection in Indonesia to techno-managerial terms that reflect a post-politicizing of the environment, as outlined in Erik Swyngedouw's critical social science literature. In this chapter, we look specifically at the content and application of these local government environmental performance assessment tools. While they may appear to cover key points of environmental good governance, their technocratic mode character is disguising politico-business linkages and oligarchical interests that damage the environment. Environmental crisis, social conflict, and democratic regression are consequently on the increase in Indonesia.

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4.1 Introduction

> Environments are specific historical results of socio-physical processes. (Swyngedouw, 2018, p. 88)

In mid-June 2021, Indonesia's Environment and Forestry Minister, Siti Nurbaya, bestowed the Nirwasita Tantra – or "Green Leadership" – Award to the Banyuwangi District Government from East Java Province. The award is given annually to provincial and district/municipal governments that exhibit the best performance in mainstreaming the environmental sustainability agenda in their policies. The selection is based on the submission of the "Regional Environmental Management Performance Information Document" (Dokumen Informasi Kinerja Pengelolaan Lingkungan Hidup Daerah – DIKPLHD). The Banyuwangi District Government also received the Innovative Government Award (IGA) from the Ministry of Home Affairs for 3 years between 2017 and 2020 (Fanani, 2020). The IGA is the highest award given to local governments assessed to be successful in developing public service innovation.

Contrary to the public face of Banyuwangi District's exemplary performance in winning awards during this time, the district's significant environmental problems continued to worsen. Local conflicts in the Tumpang Pitu Mountains began in 2015 when the area was converted from a protected forest area to a forest production area to allow mining exploitation permits to be issued (Riski, 2016). Local inhabitants continue to maintain that the mining activities are fueling ecological crisis and affecting the sustainability of people's livelihoods.

Environmental activists who opposed the Tumpang Pitu mine in Banyuwangi Distirct were also criminalized, including Heri Budiawan and Budi Pego (Hakim & Zuhro, 2018). In the latter case, local authorities portrayed Budi Pego as an agitator spreading communist ideas, and a local court sentenced him to 4 years imprisonment in 2018. An alliance of academics and civil society activists assessed the case and found the prosecution did not present solid evidence in the trial (Hakim, 2019). The troubles in Tumpang Pitu and the Budi Pego case were not documented in the DIKPLHD report that won Banyuwangi Distirct the Green Leadership Award. The case illustrates how techno-managerial assessments neglect real problems in grassroots communities and conceal the hidden face of environmental management in Indonesia.

The government capacity to acknowledge societal problems related to natural resource exploitation and build them into effective policies is crucial. Long-standing grievances can trigger violent conflict if the government does not provide a serious response. Based on the reports from the Consortium for Agrarian Reform (Konsorsium Pembangunan Agraria – KPA), as shown in Fig. 4.1, there has been an

increasing trend of violent conflicts related to natural resource management in the last decade. KPA noted that there were almost 3500 cases in various regions of Indonesia from 2009 to 2019. It started from 89 cases in 2009, peaked in 2017 with 659 cases, and decreased slightly to 241 cases in 2019. These conflicts occurred in various sectors such as plantations, mining, forestry, fisheries, agriculture, and infrastructure (KPA, 2015, p. 5).

Local governments must provide equitable access to public services, including a sustainable environment for all residents in their territories. However, the Banyuwangi case illustrates the gap between the local government's performance assessment result and the reality faced by local communities and those activists attempting to bring difficult social and political issues into the spotlight. This contradiction raises a difficult question: How can the results of the official government assessment differ so markedly from reality? Rather than representing the consequence of inaccurate assessment, we argue that this contradictory phenomenon is caused by the problematic approach embedded in local government assessment tools that neutralize state–society relations and socio-political dimensions. The depoliticized assessment tools have methodological problems because they depend heavily on formal document sources. Rendering natural resources management and environmental protection into technical matters leads to social conflict and environmental crisis. This is why award-friendly local governments have massive environmental problems and social conflict.

In light of critical social science literature, particularly from Erik Swyngedouw, the authors maintain that the local government performance assessment tools used by Indonesian governments are institutionalizing the post-politicization of the environment. Post-politicization occurs when techno-managerial approaches become the dominant paradigm in viewing the socio-ecological arrangements of everyday

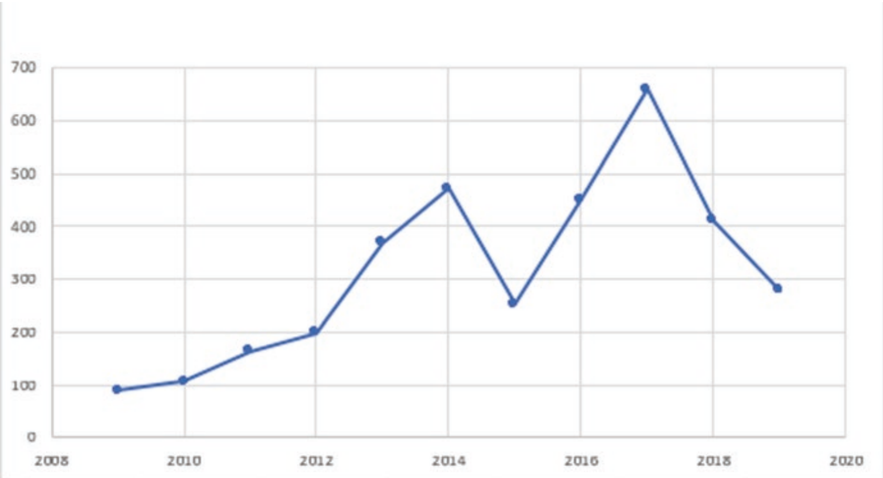


Fig. 4.1 Agrarian conflict in Indonesia, 2009–2019. (Compiled from KPA, 2013, 2014, 2015, 2016, 2017, 2018, 2019)

life. In this way, local government performance assessment tools fail to capture the complexity and conflictual aspects of socio-ecological relations. Technocratic approaches overlook ecological problems connected closely to social ties, political constraints, and interest struggles. This technocratic mode of governance and the post-politicization of the environment are contributing to democratic regression noted in Indonesia.

The authors conducted a critical examination of local government performance assessments, especially related to environmental issues, and divided it into five sections. This article is started by briefly discussing Erik Swyngedouw's concept of post-politicization and the data collection methods of this essay. We then focus on the two performance assessment tools used to select the winners of the Innovative Government Award (IGA) and Nirwasita Tantra or Green Leadership Award, using empirical insights gathered from our fieldwork. In Sect. 4.4, we analyze the impact of technocratic modes of governance on the democratic regression recently noted by scholars in Indonesia. Section 4.5 concludes the analysis with recommendations to improve the tools and promote the agenda on democratizing environments.

4.2 Post-politicizing the Environment: Concept and Definition

Post-politicization in this article refers to the concept introduced by Erik Swyngedouw in his 2018 publication entitled "Promises of the Political: Insurgent Cities in a Post-political Environment." Swyngedouw defined post-politicization as "the contested and uneven process by which consensual governance of contentious public affairs through the mobilization of techno-managerial dispositives sutures or colonizes the space of the political" (Swyngedouw, 2018, p. xvi). The techno-managerial style of the government dominates political processes within state–society relations. The government has the authority to define public issues, such as those linked to the environment, economic conditions, terrorism, or urban problems, and how to solve them. Therefore, public issues can be framed in managerial and technical terms devoid of socio-economic-political complexities, such as the structure of inequality and uneven power relations. The reality of antagonistic relations among societal groups in public affairs is processed through techno-managerial governance modes that prioritize accountancy rules, risk calculation (self-assessment), and competitive performance benchmarking (Swyngedouw, 2018, p. 8 and 34). Furthermore, Swyngedouw explains that

> Such depoliticizing gestures disavow the inherently heterogeneous and often antagonistic relations that cut through the social, and reduce the terrain of the political to the art or *techné* of public management. In other words, the political domain has been systematically narrowed over the past few decades to a techno- managerial apparatus of governance whereby fundamental choices are no longer possible or deemed reasonable. While problems and contentious issues of public concern (like environmental crises, urban revolts, terrorist threats, or economic conditions) are generally recognized, they are dealt with by

> means of consensual governance arrangements that do not question the wider social, ecological, and political-economic frame. Technological, institutional, and managerial "fixes" are negotiated that leave the basic political-economic structure intact. (Swyngedouw, 2018, p. xvi)

Post-politicization leads to the erosion of political control and accountability, contributing to democratic regression and even autocratic governance. Government policies are far from the people's aspirations and daily reality because they are formulated and implemented to serve a small group of individuals who have greater power and resources, a phenomenon linked to the rise of oligarchic policing (Swyngedouw, 2018, p. 33). The subordination of civil society power in public policy matters is not conducted through the repressive violence that commonly appears in authoritarian regimes. Domination is carried out through consensual agreements fabricated in legal-institutional mechanisms and supported by administrative experts. Instead of voices, disagreement, and discontent, we have noise. As such, the politics and discontent surrounding arrangements for public goods, such as the environment or ecological change, are neutralized through so-called "good governance" mechanisms (Swyngedouw, 2018, p. 27).

According to Swyngedouw (2018, pp. 88–89), the environment does not emerge from a vacuum but is the historical result of socio-physical processes. Therefore, socio-ecological change is never socially or ecologically neutral. He further stated that "the production of socio-ecological arrangements is always a deeply conflicting, and hence irrevocably political process" (Swyngedouw, 2018, p. 89), indicating that socio-environmental arrangements have never been and will never be neutral because of the unequal power relations in social life. As such, the production of these arrangements should refer to fundamental questions, such as who gains and who pays for them, who benefits from, and who suffers (and in what ways) from ecological change (Swyngedouw, 2018, p. 89). Technocratic modes of governance undermine efforts to democratize environments, but democratic approaches are necessary because they pave the way for "identifying the strategies through which a more equitable distribution of social power and more inclusive modes of producing natures can be achieved" (Swyngedouw, 2018, p. 89).

4.3 Data Collection Methods

This essay reflects the authors' experience developing alternative local government performance assessments for environment and natural resource management since 2016. The authors did not work with the tools or teams linked to the assessments used in the IGA or the Green Leadership Awards described above. At first, we conducted fieldwork to observe the local government performance on natural resource management in Bima District (West Nusa Tenggara), Kotawaringin Timur District (Central Kalimantan), Gianyar District (Bali), Pandeglang District (Banten), and Medan City (North Sumatra). This fieldwork provided the basis for formulating assessment components and indicators (Satriani et al., 2021).

From this research in five regions, we discovered that the crucial factors influencing the success of local governments in dealing with issues of natural resource exploitation are license permit processes, access to information, public participation, and impact management. These four issues became the focus of the alternative assessment tools later developed by the authors. These new assessment tools enabled assessors to identify and record the complexities of natural resource management and to highlight real problems such as undocumented institutional problems and local conflict, patronage politics, shortcomings in existing socialization/participation mechanisms, criminalization of activists, and local community vulnerability to disasters.

The Asia Foundation assisted the authors in refining the instruments by supporting additional activities, such as fieldwork, expert meetings, and workshops. Collaborating with the Asia Foundation, the authors tested their revised local government performance assessment tools in seven districts and municipalities: Banyuwangi District (East Java), Klungkung District (Bali), Boalemo District (Gorontalo), Kubu Raya District (West Kalimantan), Ogan Komering Ilir District (South Sumatra), Pelalawan District (Riau), and Samarinda City (East Kalimantan) (Permana et al., 2019). Additional fieldwork was carried out so that the instrument could better accommodate various local contexts. The authors obtained numerous inputs from strategic stakeholders during the testing process that helped synchronize the needs of central and provincial governments and civil society organizations.

The authors compared the newly proposed tool with other local government performance evaluation tools, including the IGA assessment of the Ministry of Home Affairs and the DIKPLHD and Green Leadership Award assessments tools from the Ministry of Environment and Forestry. We compared data sources, assessment methods, and assessment indicators. Overall, our approaches were significantly different from existing government performance evaluation processes that do not accommodate or, in some cases, even involve critical groups in the region. Our system does not rely on submissions of lengthy documents but seeks more critical assessments from progressive NGOs and intellectuals.

4.4 Review on Local Government Performance Assessment Tools

Local government performance assessment systems are relatively recent phenomena in Indonesia, dating from the end of one of the most stringent centralized authoritarian systems in the world (Booth, 2014, p. 33). During the New Order period (1966–1998), local governments acted only as implementers of central government policies. The onset of widespread democratization and decentralization that followed in 1999 was marked by a lack of local government capacity and institutional memory to manage their governance functions autonomously, as well as the

policy and program tools needed to formulate plans and later evaluate their work. Therefore, local governments tended to fit into a technocratic mode that defined performance in basic administrative-managerial terms. This one-size fits-all approach to mainstreaming decentralization was endorsed by international donors such as the World Bank (Hadiz, 2010).

The central government took the lead in establishing local government performance evaluation systems. Most systems created by line ministries and agencies used a “ranking system” in their evaluation tools used at provincial and district/municipal levels. Positive assessment result was linked to heightened prestige as well as access to budget funding and other support incentives. Decentralization saw several key functions become the authority of local governments, but Law No. 23/2014 on Regional Autonomy brought many backs under central government control. Local governments, nevertheless, remain the key intermediary actor between the central government and communities. They have substantial authority over key matters, such as providing licenses and recommendations for natural resource exploitation, including the Environmental Impact Analysis (Analisis Mengenai Dampak Lingkungan – AMDAL), and land use permits as determined in Regional Spatial Plans. Local government agencies are also crucial in providing public services related to environmental protection to citizens.

There was a proliferation of evaluation systems in line with the development of modern public governance. However, the capacity for evaluation in local government is uneven, leading to poor standards of reporting and assessment of results (Sanderson, 2001, p. 297). In the Indonesian context, state ministries and agencies created their own local government performance evaluation systems. The Ministry of Home Affairs was the most active in this, as they are responsible for controlling and monitoring the governance work of local governments.

The majority of these local government performance evaluation systems are based on administrative requirements and managerial or technocratic performance relating, for example, to budget spending, the issuance of local regulations, standard operational procedure (SOP) documents, visual documentation (photos and videos), supporting infrastructure, and news from online media. As such, local governments that are diligent in collecting and submitting these documents have a greater chance of rising in the ranking system and of winning awards. Although some assessment tools include opinion surveys or interviews, the extent to which these modalities involve all stakeholders and the depth of information is unclear.

To present a more detailed picture of local government performance assessment tools, we consider the mechanisms associated with the Regional Innovation Index or Innovative Government Award (IGA) and the Nirwasita Tantra or Green Leadership Award. We chose these tools because of their high public profile and because they are often used as the basis for claiming success in local government performance. In addition, these two assessment tools are still actively used until this time. Although the IGA does not explicitly evaluate the performance of local governments in environmental affairs, it helps illustrate the technocratic mode of government that is the basis for local government performance evaluations in general.

4.4.1 The Innovative Government Award (IGA)

The issue of promoting innovation at local government levels came to the forefront following the issuance of Law No. 23/2014 as the amendment of Indonesia's regional autonomy law that was previously regulated in Law No. 22/1999 and Law No. 32/2004. In 2018, the Ministry of Home Affairs issued a regulation to evaluate local government innovation initiatives and to map progress over time. The index also aims to benchmark and enable sharing experiences about innovation between local governments (Tan, 2019). Assessment results are announced to the public, and winners receive incentives from the central government. The Banyuwangi District Government received 9 billion rupiah (USD 624 thousand) when they won the award in 2019 (Gewati, 2019).

In the initial assessment stage, each local government must collect and submit information to the Ministry's online portal (http://index.inovasi.otda.go.id/jasa/). Two types of supporting documentation must be submitted via the portal, i.e., the local government profile and the profile of the innovation program itself. The supporting documents related to the local government profile are (1) local government vision and mission; (2) the number of innovations produced by the local government; (3) the amount of per capita income, employment, investment, and regional income (Pendapatan Asli Daerah – PAD); (4) the audit result from Audit Board of the Republic Indonesia (Badan Pemeriksa Keuangan – BPK); and (5) Human Development Index (Indeks Pembangunan Manusia – IPM).

Meanwhile, the documents that must be submitted related to the profile of the innovation program are (1) local government regulation on the innovation program; (2) the availability of human resources; (3) budgeting documents; (4) information technology infrastructure; (5) document of the public campaign; (6) document on technical implementation; (7) document of public complaint service; (8) document of satisfaction survey; and (9) visual documentation, such as photos and videos showing program activity (Kemendagri, 2019). Once a local government sends all the documents, the central government forms a team to assess the submission. The assessment team chooses the best local government at provincial and district/municipal levels. They will also visit the regions to validate the documents. The Ministry of Home Affairs invites winners to present their innovation policies in Jakarta. Many aspects of the submission and review processes clearly follow accepted "good governance" approaches, and the IGA process shows the government's normative policy commitment.

Based on our empirical findings from our fieldwork in 12 regions from 2016 to 2019, the authors found that the IGA assessment method is problematic (Syafi'i & Gayatri, 2019; Satriani et al., 2021; Permana et al., 2019). The driving force within Indonesia's assessment bureaucracy is applying formal mechanisms that ensure positive outcomes in government reports and submissions. A noticeable factor in the failure of administrative-based assessments to comprehend reality is the presence of patronage networks within the bureaucracies. Possessing relevant skills, competencies, and credentials needed to conduct assessments was not as important as

political interests regarding the appointment and rotation of employees (informant interview, 2018).

The indicators of participation and socialization were also problematic. We found that the practice of promoting public participation was simply by sending a letter to the village head. Village heads then had the authority to decide who to invite to "public" meetings. The government used residents' signatures from the attendance list to claim participation in policymaking activities. This practice illustrates how technocratic modes of governance assessment warp relations between the state and society and spread misrepresentation. It is a pattern in normalizing "good governance," which reduces political–social input to the formal systems.

We also found that ineffective policy socialization from the local government was a direct cause of the violent conflicts in Bima Regency, West Nusa Tenggara Province, in 2010 and 2012 (Satriani, 2015). The local government merely conveyed government policies without collecting and considering residents' concerns and aspirations. People directly affected by the government policies and programs did not have access to sufficient information on the exploration and exploitation of natural resources in their local area (Satriani et al., 2021). Residents were surprised by sudden exploration activities without any public consultation.

4.4.2 Nirwasita Tantra (The Green Leadership Award)

Nirwasita Tantra, popularly known as the Green Leadership Award, is based on the Regional Environmental Management Performance Information Document (Dokumen Informasi Kinerja Pengeloaan Lingkungan Hidup Daerah – DIKPLHD) at the provincial and district/municipal levels. The DIKPLHD is formulated by a team formed by the head of local government consisting of bureaucrats, academic representatives, and community representation. This document consists of two reports: the first report contains the executive summary, and the second report contains information on the performance of local environmental management. The complete report explains environmental problems in the region, their causes, impacts, and efforts to improve environmental quality based on the analysis of Driving Force, Pressure, State, Impact, and Response (Pusat Data dan Informasi Sekretariat Jenderal KLHK, 2018, p. 1). The team should also elaborate on the priority issues in improving the quality of the environment.

According to the official documents, several key aspects of the DIKPLHD formulation process must involve public participation and/or issues of recognized public concern. However, due to the fact that the local government directly selects DIKPLHD authors, most of the team comprises hand-picked bureaucrats, and the independence of the team and its assessment cannot be guaranteed. It is difficult to find any sort of critical analysis on environmental issues and the management of natural resources in a DIKPLHD report. Local governments want and sometimes need a positive assessment result in order to access resources or boost prestige. As such, the DIKPLHD approach is unlikely to present factors like lucrative relations

between government elites and business actors and their links to environmental damage. Therefore, the formulation of DIKPLHD should involve independent civil society organizations with a progressive and independent position in environmental and natural resource issues, such as the Indonesian Forum for Environment (*Wahana Lingkungan Hidup Indonesia* – WALHI) and/or the Indonesian Legal Aid Foundation (*Yayasan Lembaga Bantuan Hukum Indonesia* – YLBHI).

The involvement of organizations such as WALHI and YLBHI could make the DIKPLHD process more critical and objective and ensure that government assessment and reporting cover all sides of environmental governance in the regions. In our fieldwork research, we found many instances of undocumented institutional problems and local conflicts. Although Banyuwangi District Government received the Green Leadership Award, local institutional capacity in mitigating potential environmental impacts is insufficient. For example, the district lacks an environmental laboratory to test and measure environmental damage (Satriani et al., 2021) but has devoted resources to business investment licensing through its Public Service Mall.

Another fundamental weakness is that the DIKPLHD cannot capture the complexity of environmental problems and ecological crises in the regions because it sidelines political dimensions to maintain the façade of good governance. Environmental issues are deeply politicized and conflictual, but the DIKPLHD frames them in a nonpolitical approach. The detailed case of the violent conflict at Tumpang Pitu and the criminalization of environmental activists, such as Budi Pego, is hardly mentioned in Banyuwangi District's DIKPLHD, even though it had a significant impact on local livelihoods and attracted public concern. An environmental assessment that ignores the nature of asymmetric power holders in a society and emphasizes the technocratic aspects of governance will fail to capture the complexity of ecological problems.

4.5 Post-politicizing the Environment and Indonesian Democratic Regression

The concept of post-politicization defined by Swyngedouw (2018) is relevant to criticizing local government performance assessments in Indonesia. This concept comprehends the social construction of techno-managerial arrangements perceived as "normal" forms of governance. The domination of technocratic modes of governance makes environmental regulation in Indonesia fail to capture complex realities and conflictual relations in socio-ecological change. Environmental change is not a neutral process but is influenced by the interests of asymmetric power holders in the society. Environmental arrangements result from political processes and power plays, but Indonesian systems tend to be non-political. Therefore, the results of the local government performance assessments are incapable of reflecting real

conditions. As such, this kind of assessment is incapable of issuing a "wake-up call" for the government to respond to ecological crises and environmental damage.

Post-politicization is a concept that exposes the weakness of "good governance" (Swyngedouw, 2018, p. 27). In our current good governance epoch, techno-managerial reference frames dominate the running of government and shape state–society relations. Techno-managerial approaches make "the state operate increasingly "at a distance" from the concerns, drives, and desires of large parts of civil society" (Swyngedouw, 2018, p. 33). When policies on natural resource and environmental management are not inclusive, protests and resistance easily occur, as seen in Indonesia's increasing trend of agrarian conflicts over the last decade (see Fig. 4.1). "Oligarchic policing" – wherein the politico-business elite determine government policies and practices and deny access to underprivileged societal groups – becomes increasingly evident. Community members who take a public stand become targets and are arrested and imprisoned, such as Effendi Buhing, an indigenous Kinipan community leader in Central Kalimantan. Effendi was arrested and charged with theft, assault, and robbery (Pahlevi, 2020). Excessive deforestation in Central Kalimantan has damaged natural environments on a massive scale, making local inhabitants vulnerable to floods and landslides.

The existing local government performance assessment fails to capture the power asymmetry dimension and structure of inequality that influences the natural resource exploitation process. In the post-politicization concept, power asymmetry is indicated by oligarchic policing. It occurs when the nonelite civil society is marginalized in the policy process because the government only serves individuals with greater power and resources (Swyngedouw, 2018). Oligarchic policing triggers conflicts and protests and contributes to the ecological crisis and disasters in Indonesia. The 2021 flood in South Kalimantan also provides insight into how predatory political-economy elites caused people to be vulnerable to climate hazards due to massive environmental damage (Permana, 2021). The lucrative politico-business linkages transformed the green zones and water catchment areas along the Barito River into extractive industries such as mining and palm oil plantations.

Another example is the haze crisis that occurs every year in Sumatra and Kalimantan. Studies have found that the greatest challenge to stopping the crisis is powerful clientelism networks between palm oil companies and political elites (Varkkey, 2015). The companies' plantation activities are protected, including using fire for land clearing. Others have noted that land clearing with fire increases around the time of local elections because many politicians use land for vote-buying (Purnomo et al., 2019). Therefore, technical solutions, such as strengthening government capacity in firefighting services, will not solve the more fundamental problem.

The increasing intensity of ecological disasters is also symptomatic of democratic regression. Experts have an emerging consensus that Indonesia is suffering democratic regression (Warburton & Aspinall, 2019, p. 256), which is characterized by the presence of national and local oligarchs within a "system of power relations that enables the concentration of wealth and authority and its collective defense" (Hadiz & Robison, 2013, p. 37). The democratization that began in 1998, followed

by decentralization in 1999, did not radically change the national power structure and the politico-business oligarchy survived (Hadiz & Robison, 2013, p. 38). The adoption of techno-managerial governance approaches indirectly contributed to this democratic regression because of the erosion of public control and accountability (Swyngedouw, 2018, p. 33). In the Indonesian context, the performance of local governments is assessed with certain norms that exclude control from society. Thus, protests and discontent, which are part of public control, are delegitimized through a series of managerial-expertise justifications. The decline of public control can be exemplified by the weakening of public control in producing environmental impact assessment (AMDAL) as part of the business license process under the country's recent Omnibus Law (Permana, 2020).

4.6 Conclusion

Based on our fieldwork and academic review, the authors conclude that local government performance assessments, such as the IGA and DIKPLHD, fail to capture the reality of environmental change in Indonesia, especially the complex problems related to power relations and the structure of inequality. Although only two examples have been reviewed in this paper, they are indicative of the pervading problems of techno-managerial approaches to environmental management. Local governments lack the capacity to conduct assessments while nongovernment participation in assessment teams and processes is flawed. The assessments tend to rely on documentation, and so diligent administration and complete submissions are rewarded, not performance. Conflicts are increasing due to the marginalization of political–social aspects. Participation of progressive, civil society institutions is needed to democratize the environment and improve assessment results.

While local government performance assessments need to change their reliance on formal document sources, they must also accommodate progressive civil society organizations, such as WALHI and YLBHI, in the assessment process. These two institutions have networks in 34 provinces in Indonesia, with human resources to act as assessment partners. They can also recommend local academics of high integrity to be involved in the assessment in each region. In this way, the participatory approach to assessing local government performance is no longer just a normative tagline but will become a substantial principle. Without radical improvement, assessment activities will only be "business as usual" amidst a looming ecological crisis. Local government performance assessments should be able to contribute to democratizing environments in Indonesia. Democratizing environments means adopting more egalitarian socio-ecological arrangements, more equitable distribution of social power, and more inclusive modes of producing natures (Swyngedouw, 2018, p. 89).

References

Booth, A. (2014). Before the 'big bang': Decentralization debates and practice in Indonesia, 1949-99. In H. Hill (Ed.), *Regional dynamics in a decentralized Indonesia* (pp. 25–44). ISEAS.

Fanani, A. (2020, December 19). *Banyuwangi Kembali Jadi Kabupaten Terinovatif* (Banyuwangi is back to being the most innovative district). Retrieved from Detik.com: https://news.detik.com/berita-jawa-timur/d-5302076/banyuwangi-kembali-jadi-kabupaten-terinovatif

Gewati, M. (2019, October 8). *Jadi Kabupaten Terinovatif se-Indonesia di IGA 2019, Banyuwangi Dapat Rp 9 Miliar* (Becoming the most Innovative Regency in Indonesia at IGA 2019, Banyuwangi gets IDR 9 billion). Retrieved from Kompas.com: https://regional.kompas.com/read/2019/10/08/09255411/jadi-kabupaten-terinovatif-se-indonesia-di-iga-2019-banyuwangi-dapat-rp-9

Hadiz, V. (2010). *Localising power in post-authoritarian Indonesia: A Southeast Asia perspective*. Stanford University Press.

Hadiz, V. R., & Robison, R. (2013). The political economy of oligarchy and the reorganization of power in Indonesia. *Indonesia, 96*, 35–57. Retrieved from https://doi.org/10.5728/indonesia.96.0033

Hakim, R. Z. (2019, March 10). *Eksaminasi Pakar Kasus Budi Pego: Tak Ada Unsur Melawan Hukum, Ada Tekanan?* (Examination of experts in the Budi Pego case: There's no unlawful element, is there pressure?). Retrieved from Mongabay Indonesia: https://www.mongabay.co.id/2019/03/10/eksaminasi-pakar-kasus-budi-pego-tak-ada-unsur-melawan-hukum-ada-tekanan/

Hakim, R. Z., & Zuhro, Z. A. (2018, January 26). *Budi Pego, Aktivis Penolak Tambang Tumpang Pitu Itu Kena 10 Bulan Penjara* (Budi Pego, activist who rejects Tumpang Pitu mining sentenced 10 month prison). Retrieved from Mongabay Indonesia: https://www.mongabay.co.id/2018/01/26/budi-pego-aktivis-penolak-tambang-tumpang-pitu-itu-kena-10-bulan-penjara/

Kemendagri, R. I. (2019). *Petunjuk Teknis Indeks Inovasi Daerah 2019* (2019 regional innovation index technical guidelines). Kementerian Dalam Negeri RI.

KPA. (2013). *Laporan Akhir Tahun 2013: Warisan Buruk Masalah Agraria di Bawah Kekuasaan SBY* (2013 year end report: Poor legacy of Agrarian problems under SBY's power). Konsorsium Pembaruan Agraria.

KPA. (2014). *Catatan Akhir Tahun 2014: Membenahi Masalah Agraria, Prioritas Kerja Jokowi-JK pada 2015* (2014 year end notes: Fixing Agrarian problems, Jokowi-JK's work priority in 2015). Konsorsium Pembaruan Agraria.

KPA. (2015). *Catatan Akhir Tahun 2015: Reforma Agraria dan Penyelesaian Konflik Agraria Disandera Birokrasi* (2015 year end notes: Agrarian reform and agrarian conflict resolution have been taken hostage by bureaucracy). Konsorsium Pembaruan Agraria.

KPA. (2016). *Catatan Akhir Tahun 2016. Liberasi Agraria Diperhebat, Reforma Agraria Dibelokkan* (2016 year end notes: Agrarian liberation has been intensified, agrarian reform has been deflected). Konsorsium Pembaruan Agraria.

KPA. (2017). *Catatan Akhir Tahun 2017: Reforma Agraria di Bawah Bayangan Investasi* (2017 year end notes: Agrarian reform under the shadow of investment). Konsorsium Pembaruan Agraria.

KPA. (2018). *Catatan Akhir Tahun 2018: Masa depan reforma agraria melampaui tahun politik* (2018 year end notes: The future of agrarian reform goes beyond the political year). Konsorsium Pembaruan Agraria.

KPA. (2019). *Catatan Akhir Tahun 2019: Dari Aceh sampai Papua: Urgensi Penyelesaian Konflik Agraria Struktural* (2019 year end notes: From Aceh to Papua: The urgency of resolving structural agrarian conflicts). Konsorsium Pembaruan Agraria.

Pahlevi, A. (2020, October 10). Profil Pasukan Merah, Penjaga Marwah Adat Dayak dan Hutan Kalimantan (Profile of the Red Army, guardians of the Dayak Indigenous peoples and Kalimantan forests). *Majalah Tempo*.

Permana, Y. S. (2020, October 20). *Indonesia Omnibus law: Riding into an environmental cul-de-sac?* Retrieved from KITLV: https://www.kitlv.nl/indonesia-omnibus-law-riding-into-an-environmental-cul-de-sac/

Permana, Y. S. (2021, May 21). *Why politics matters: An insight from Indonesia's flood management*. Retrieved from New Mandala: https://www.newmandala.org/why-politics-matters-an-insight-from-indonesias-flood-management/

Permana, Y. S., Syafi'i, I., Satriani, S., Adaba, P. Y., & Seftiani, S. (2019). *Instrumen Indeks Kapasitas Pemerintah Daerah Dalam Pengelolaan Sumber Daya Alam* (Instrument of local government capacity index in natural resources management). Pusat Penelitian Politik – Lembaga Ilmu Pengetahuan Indonesia.

Purnomo, H., Okarda, B., Shantiko, B., Achdiawan, R., Dermawan, A., Kartodihardjo, H., & Dewayani, A. (2019). Forest and land fires, toxic haze and local politics in Indonesia. *International Forestry Review, 21*(4), 1–15.

Pusat Data dan Informasi Sekretariat Jenderal Kementerian Lingkungan Hidup dan Kehutanan. (2018). *Pedoman Penyusunan Informasi Kinerja Pengelolaan Lingkungan Hidup Daerah* (Guidelines for compiling regional environmental management performance information). Kementerian Lingkungan Hidup dan Kehutanan.

Riski, P. (2016, March 13). *Menakar Kerawanan Konflik Tambang Emas Tumpang Pitu* (Measuring the vulnerability of Tumpang Pitu gold mining conflict). Retrieved from Mongabay Indonesia: https://www.mongabay.co.id/2016/03/13/menakar-kerawanan-konflik-tambang-emas-tumpang-pitu/

Sanderson, I. (2001). Performance management, evaluation and learning in 'modern' local government. *Public Administration, 79*(2), 297–313.

Satriani, S. (Ed.). (2015). *Dinamika Peran elite Lokal dalam Pilkada Bima 2010* (The dynamics of the role of local elites in the 2010 Bima local election). Penerbit Andi.

Satriani, S., Adaba, P. Y., & Syafi'i, I. (Eds.). (2021). *Potret Kapasitas Pemda dalam Pengelolaan SDA: Penyusunan Model dan Uji Coba Instrumen Indeks di Kab. Klungkung, Kab. Banyuwangi, dan Kab. Boalemo* (Potrait of local government capacity in natural resources management: Modelling and testing of index instruments in Klungkung, Banyuwangi, and Boalemo Disctricts). Kanisius.

Swyngedouw, E. (2018). *Promises of the political: Insurgent cities in a post-political environment.* Retrieved from MIT Press Direct. https://doi.org/10.7551/mitpress/10668.001.0001

Syafi'i, I., & Gayatri, I. H. (Eds.). (2019). *Strategi dan Negosiasi dalam Konflik Air di Bali dan Banten* (Strategy and negotiation in water conflicts in Bali and Banten). LIPI Press.

Tan, M. (2019). *Kebijakan Inovasi Daerah dalam Penyelenggaraaan Pemerintahan Daerah* (Regional innovation policy in the implementation of regional government). Presented at National coordination meeting for research and development of Ministry of Home Affairs in Bidakara hotel in 21 Nov 2019.

Varkkey, H. (2015). *The haze problem in Southeast Asia: Palm oil and patronage*. Routledge.

Warburton, E., & Aspinall, E. (2019). Explaining Indonesia's democratic regression: Structure, agency and popular opinion. *Contemporary Southeast Asia, 41*, 255–285.

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Part II
Wetlands

Chapter 5
Gender and Climate Change Vulnerability: A Case Study of a Coastal Community in Pramuka Island, the Seribu Islands

Tri Saputro and Priya Kurian

Abstract Climate change poses a significant threat to people's lives and livelihoods around the globe, and communities of small low-lying islands of the developing world are especially vulnerable. As a growing scholarship demonstrates, the impacts of climate change on people's lives vary along gender lines, among other factors. Thus, understanding the gendered implications of climate change risks and impacts is essential to inform policies that are responsive to the needs of vulnerable groups. This chapter explores the implications of climate change impacts for the lives of women and men on a small and vulnerable coastal community on Pramuka Island, a part of the group of Seribu Islands, Jakarta, Indonesia. The study examines how changes in women's and men's employment, income, and time management reflect the ways in which environmental changes, including climate change, shape the everyday lived experiences of vulnerable local communities of small islands.

Keywords Climate change · Gender · Fisheries · Coastal community

5.1 Introduction

Indonesia, the largest archipelagic state with over 17,500 islands, faces a significant risk of climate change impacts, including floods, droughts, sea level rise, increasing temperatures, and changing rainfall patterns (World Bank, 2020; Wong et al., 2014). Such risks are even higher in smaller islands (Wirawan, 2010), such as the Seribu Islands (Firman et al., 2011). With a constellation of over 110 small islands to the north of the capital city Jakarta, most of the Seribu Islands are only ±1-meter-high

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from sea level (Statistics Kepulauan Seribu Administrative Regency, 2017a, b) and are known for their weak resource management practices (Fauzi & Buchary, 2002). The communities living on the Seribu Islands are especially vulnerable to the negative impacts of climate change, while also being among the most socioeconomically vulnerable in the country (Firman et al., 2011). Such vulnerabilities are enhanced by exposure to natural/human-induced disasters, with the experience of disasters being mediated by gender roles and gender relations that "shape and are shaped by social, spatial and temporal structures and practices" (Tickamyer & Kusujiarti, 2020, p. 233).

In the context of environmental change and, more specifically, climate change, a significant scholarship has demonstrated that the impacts of such changes are not gender neutral (see, e.g., Agarwal, 1992, 2010; Arora-Jonsson, 2014; Dankelman & Jansen, 2010; Nelson et al., 2002). Gender, a concept that invokes ideas around gender roles and gender relations, also serves as an analytic category that helps us understand how gendered power relations permeate institutions and shape social practices, and access to knowledge and resources (see, e.g., Kurian, 2019; MacGregor, 2019; Arora-Jonsson, 2014). Feminist scholars have argued that gendered values and masculine ideologies underpin colonialism, capitalism, and a development agenda that has led to the crisis of climate change (see, e.g., MacGregor, 2019; Gaard, 2015). In addition, women in the Global South, particularly from lower socioeconomic classes with limited access to resources and whose social contexts are framed by gendered social and cultural norms, are more likely to face greater challenges of survival. For example, climate change-related natural/human-induced disasters and environmental degradation have significant implications for women's workload and vulnerability (Nagel, 2017; Tickamyer & Kusujiarti, 2020). Yet, how women, men, families, and communities negotiate the realities of a climate-changed, disaster-prone world, particularly in the context of a developing island state such as Indonesia, requires more academic attention.

As scholars have noted, understanding differences of community experiences and responses toward the risk of climate change on the basis of gender is crucial to develop strategies for just and equitable climate-related policies, while increasing the resilience of already marginalized groups (Tickamyer et al., 2014). Despite the significance of this issue, research focused on gender roles, relations, and values in the context of sustainable development and climate change impacts on small islands in Indonesia is limited (Tickamyer et al., 2014). This chapter addresses the gap in the literature on gender and climate change in Indonesia through a specific focus on a small and vulnerable coastal community on Pramuka Island, a part of the group of Seribu Islands.[1] It explores how changes in women's and men's employment, income, and time management reflect the ways in which environmental changes, including climate change, shape the everyday lived experiences of vulnerable local communities of small islands. It begins with a brief background on climate change

[1] We acknowledge the reality of gender diversity that goes beyond the binaries of the roles and experiences of males and females. In the context of this study, all the research participants self-identified as male or female and this is reflected in the language we use.

impacts on Indonesia and a review of the gender and climate change scholarship and then provides an overview of the research methodology before turning to the findings and analysis, which contribute to a bottom-up, gender-sensitive advancement of climate adaptation policies from the perspective of the local community. As Boissière et al. (2013) argue, the view of the local is fundamental to determining appropriate strategies to adapt to the changing climate.

5.2 Climate Change Impacts and Gender in Indonesia

Anthropogenic climate change, as flagged by the reports of the Intergovernmental Panel on Climate Change (IPCC), has significant negative impacts on the economy, society, environment, and culture of countries across local, national, and global scales (Wong et al., 2014; IPCC, 2013a, b). Alongside the impacts on biodiversity, patterns of precipitation, droughts, and floods in many parts of the world, the reports note that low-lying and small islands are most vulnerable to severe impacts of climate change (Wong et al., 2014). In the context of Indonesia, evidence of climate change is seen, for example, in the decrease in the annual precipitation and drier climate condition in West Java (Kaars & Dam, 1997). The country also experienced its hottest year in 2016, with the average temperature being recorded as 1.2 Celsius higher than usual (Indonesian Agency for Meteorology, Climatology and Geophysics, 2018). Such changes, with the resulting water scarcity and intensified droughts in parts of Java Island, for example, have affected agricultural systems and thus impacted the livelihoods of communities (Widiyanti & Dittmann, 2014). The shifting average temperature in Indonesia has also led to a decline in rice crop yield and farmers' income, affecting the country's social and economic systems (Caruso et al., 2016). The social and economic impacts of climate change on sustainable development in Indonesia, spanning areas of food production, health, infrastructure, and livelihoods, are not uniform but vary across gender, class, and other cross-cutting societal cleavages.

The relationship between humans and the environment is gendered, and this relationship varies in different social contexts and changes over time (Dankelman & Jansen, 2010). Furthermore, gender also plays a role in at least three different aspects of climate change, namely, the creation of climate change knowledge, experience of climate change impacts, and the responses toward them (MacGregor, 2010; Arora-Jonsson, 2014). In the context of developing countries, Agarwal (2010) argues that women and men are disparately affected by environmental change in terms of their income, time, health, nutrition, knowledge system, and social-support network, and their responses toward environmental governance also vary. Women's responsibilities for ensuring adequate access to water for household needs result in putting them at a higher risk of physical injuries (such as spinal injuries), especially during droughts when they need to walk further (Nagel, 2017; Sorenson et al., 2011). In addition, these women also sacrifice their time that they could otherwise use for education and income-earning activities. Such gendered impacts of

environmental changes are reflected in the differential impacts of climate change, with implications for local environmental governance.

In the Indonesian context, vulnerability to climate change is enhanced by social inequalities, and as in the case of disaster risk and vulnerabilities, "gender is invariably a central component" of the factors that increase such vulnerability (Tickamyer & Kusujiarti, 2020, p. 236). Patriarchal gender relations in Indonesia reinforce male dominance (Hubeis, 2010) and, as elsewhere in much of the rural Global South, women are responsible for domestic tasks, including provision of water for cooking, washing, and drinking, as well as primary responsibility for childcare, while men are designated as the major income earner in the family. Aside from patriarchal views, family dynamics and gender relations in Indonesia are also strongly influenced by religious norms, with an expectation for women to be obedient wives and mothers, while fathers are viewed as the custodians and protectors of the family (Rinaldo, 2008). Thus, gender roles and relations are deeply imbued by power inequalities that in turn shape the nature of climate change impacts on people.

5.3 Pramuka Island, the Seribu Islands: The Context

Pramuka Island, one of the islands in the Seribu Island archipelago, is located 74 km from the main island of Jakarta (see Figs. 5.1 and 5.2). It has a total area of 16 Ha and lies 1 m above sea level.

The following graphs from the local meteorological station show the changes in average temperature and rainfall in the Seribu Islands from 1973 to 2017 (see Fig. 5.3), which are potentially reflective of climate change impacts.



Fig. 5.1 Indonesia map. (Google Maps, 2022)



Fig. 5.2 Pramuka Island map. (Panggang Island Administrative Village, 2018; Google Maps, 2018)

Furthermore, statistics of the occurrence of storms and rainy days in the Seribu Islands (see Fig. 5.4) also show gradual changes. The number of rainy days in 2011, 2014, and 2016 increased gradually as did the frequency of storms. Although the cause of these changes has not been definitively established, they are in keeping with predicted climate change-related impacts.

At the time the research was conducted in 2018, Pramuka Island had 1894 inhabitants, with fishing as the dominant community activity (Panggang Island Administrative Village (PIAV), 2018). Of this population, 1059 (55.9%) were adults and 835 (44.1%) children. The gender make-up of the population was 955 (50.4%) females and 939 (49.6%) males. Most people in Pramuka Island live in a family unit. The total number of households on the island comprises 584 units, of which only 71 (12.2%) are deemed female-headed households. Most men in the island work as fishermen, while women more often work as traders. The graph below describes the distribution of occupations in the community at the village level (Fig. 5.5).

In line with the IPCC's (2014a, b, 2021) observations about coastal flooding in Southeast Asia, including Indonesia, and predictions about the displacement of people in low-lying coastal zones by 2100, Firman et al. (2011) argue that people in the Seribu Islands and on the main island of Jakarta are vulnerable to the risk of climate-related hazards in terms of flooding, sea-level rise, and intensified storms. The increased frequency of natural/human-induced disasters and climate-related hazards thus threatens the livelihood of local communities, exacerbating the vulnerability of these islands.

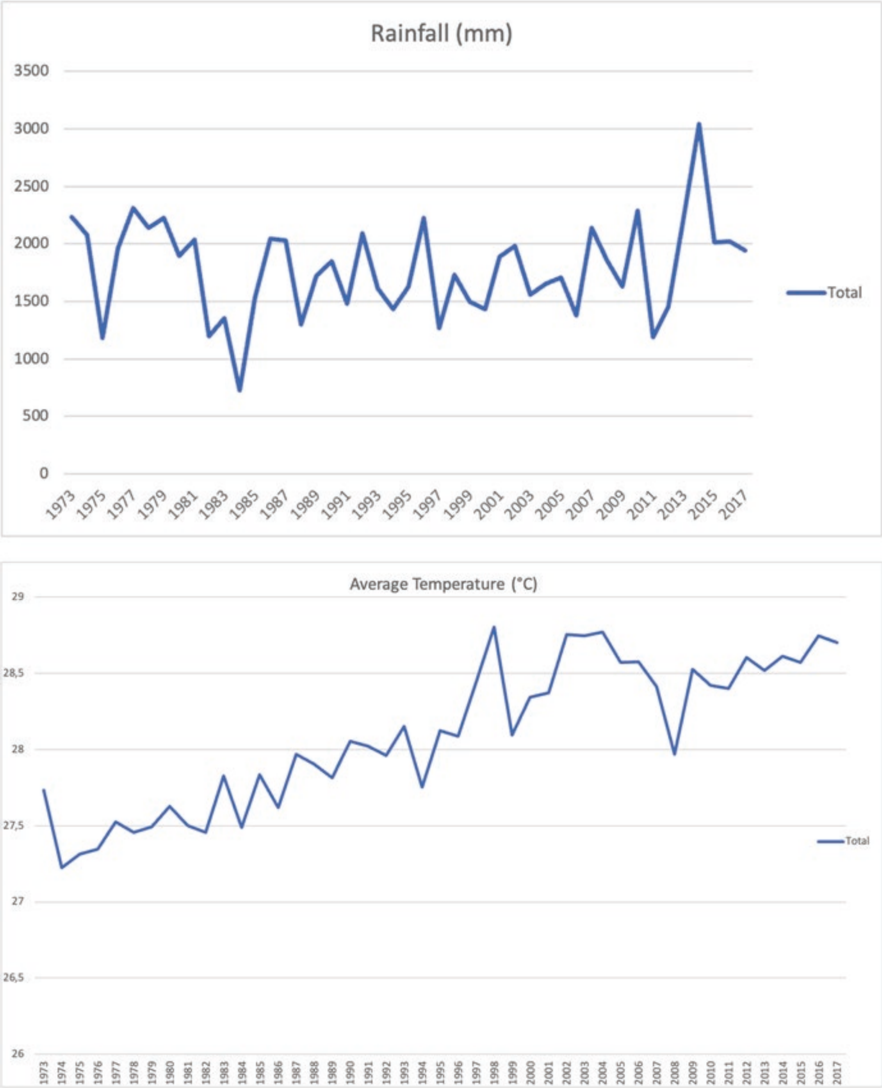


Fig. 5.3 Temperature and rainfall change. (Indonesian Agency for Meteorology, Climatology and Geophysics, 2018)

5.4 Methodology

This research deploys an interpretivist qualitative research methodology to investigate Pramuka islanders' understanding of the environmental changes they observe and the challenges that such changes pose to their community. It draws on the stories and experiences of members of the community. We used semi-structured

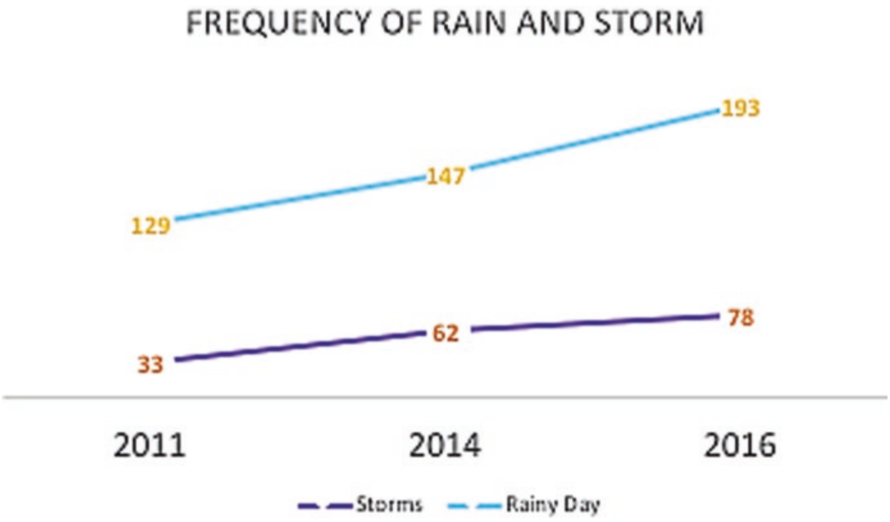


Fig. 5.4 Frequency of rain and storm in the Seribu Islands (2011, 2014, and 2016). (Statistics Kepulauan Seribu Administrative Regency, 2012–2017)

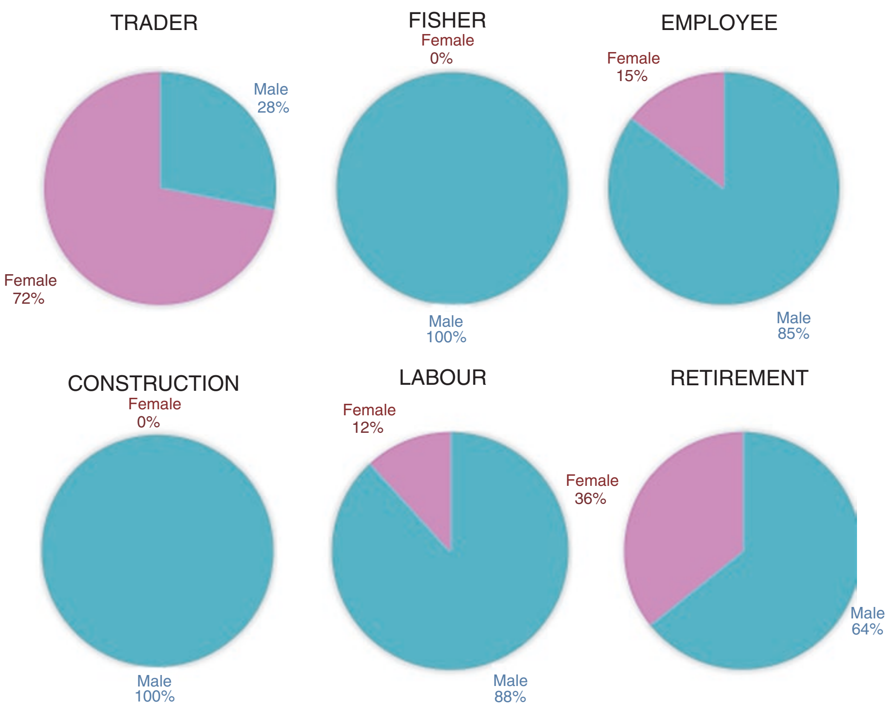


Fig. 5.5 Distribution of main occupations of females and males in Pramuka Island. (PIAV, 2018)

interviews to develop a rich understanding of the experiences and impacts of climate change risks of women and men. Using purposive sampling, nine male and seven female participants were selected on the basis of gender and occupation to capture their everyday lived experiences in the face of a climate-changed world.

The 16 semi-structured interviews, conducted in 2018, lasted approximately 30 min to 1 h. To maintain the confidentiality of the participants, we coded and classified the respondents using their gender, an ordinal number, and occupation, for instance: Female 1, Trader; or Male 1, Fisherman. In addition, three semi-structured interviews were also conducted with representatives of the Indonesian government working in the areas of climate change and/or gender, including representatives from the Ministry of Environment and Forestry (coded as MoEF1), Ministry of Women Empowerment and Child Protection (coded as MoWE1), and the Seribu Islands Regional Environmental Agency (coded as SIEA1). The purpose of these interviews was to gain broad information about the community's current situation and climate change.

Interview questions covered aspects of the community's life, such as their perceptions of the changes in seasonal patterns, fisheries resource depletion, the frequency and intensity of severe storms, waves, and rainfall, and availability of freshwater. The interview questions also explored how the community copes with any changes, as well as the nature of gender relationships. Additionally, field observation was conducted and available records concerning the research topic were collected to strengthen the empirical evidence of this research. The interviews were conducted in Bahasa and then translated and transcribed by the first author. Data from interviews were thematically analyzed (Braun & Clarke, 2006; Lawless & Chen, 2019) and examined against insights from the literature on gender and climate change. A close reading of interview transcripts led to a process of generating themes, followed by an analysis and discussion of these themes. An explanation of the case was developed in a narrative fashion in a way that was theoretically rigorous (Yin, 2014; Bryman, 2016). The themes spanned gender norms and livelihoods, reduction in fish stocks and their implications for men and women, and the impacts of changing weather patterns on women and men.

5.5 Findings

5.5.1 Gender and Livelihood in the Pramuka Island

The Pramuka Island society follows traditional gender norms in Indonesia where women are typically responsible for domestic tasks such as making food for the family and taking care of children. In contrast, men tend to be the primary breadwinners of the family and act as family representatives at public hearings, such as those around the use of natural resources, including fisheries and aquaculture program development. Participants described these gender expectations as follows:

> We (men) must make an effort to support children and wife; we need to fulfil basic family needs every day; we need to eat every day; we can't just sit. When the weather (in ocean) is not supportive, we look for another job on the land, like construction work. (Male 9, Fisherman)

> Yes, I take the role for taking care of children. Their father works, I help him with selling these (food products). (Female 2, Trader)

However, despite these gender norms, women also undertake work outside the home to gain additional income for their families, such as selling food and produce, when their time allows. Similarly, men also contribute to domestic labor, such as undertaking some childcare activities when required. This pattern of some men performing domestic roles when they are not fishing or after they get home from the ocean is also found in several other fishing communities in Indonesia (Indrawasih, 2015).

Fishing is the major income-earning activity for men, serving as the primary source of income for 62.2% of the total male population in Pramuka Island (PIAV, 2018). No women were involved in fishing. The fishermen normally go fishing between sunrise and late afternoon every day when the weather is good. Interviews and field observations revealed that there are two categories of fishermen: independent fishers and dependent fishers. The dependent fishers usually get a loan from their patron to purchase a boat and then sell their fish – either for consumption or for aquariums – exclusively to the patrons. They are also required to catch enough commercial fish to pay their debts to the patron. On the other hand, independent fishers have control over their income with no debts to pay off and their fish catch is made up of a mix of commercial and noncommercial fish. The patron–client system in small-scale fishing practices in Indonesia is a common practice, with many small island territories following this fishing pattern (Miñarro et al., 2016).

Fishing on Pramuka Island is highly dependent on the weather situation and fishermen tend not to go fishing during rainy and windy weather. When they cannot go fishing, they usually engage in other forms of employment to sustain themselves economically, including working in the tourism sector (mostly during weekends or holidays) by renting boats and providing recreational services for tourists.

Women, on the other hand, mostly perform domestic roles as their main responsibility whilst running micro-enterprises to support the family financially, when necessary. Women tend to participate in trading activities, and at the time of this study, they made up 72% of traders at the village level, while 28% were men (PIAV, 2018). Traders are typically micro-entrepreneurs, such as stallholders and street vendors, who sell a range of products including groceries, fish processed foods, snacks, and beverages. In interviews, many women traders expressed their preference for being stallholders or street vendors as a way of helping the family's financial situation while managing their domestic duties. Some of the women managed these responsibilities by bringing their children to work with them and letting them play around their stalls. Some children on the Island, especially adolescent girls, were also seen helping their mothers to look after their stalls and helped to serve

foods and drinks when customers visited the shops. One female trader recalled a similar experience of how, when she was a child, she had helped her mother with her selling activities:

> Since I was a kid my mother had taught me to sell, walking around the island after school, and before school; I was selling fried banana, traditional cakes; even now I'm passionate about selling. (Female 2, Trader)

No women, however, were seen working as fishers. The gendered notions of fishing activity vary across coastal communities in Indonesia. For instance, women in Deli Serdang Regency, North Sumatra, Indonesia, similar to women in Pramuka Island, consider fishing atypical and even taboo for women. But in other parts of the country, such as in Hitu Village, Ambon, and Kalibuntu Village, East Java, women go fishing in the ocean with rods or even plunge into the sea to find snails (Indrawasih, 2015).

In terms of the role of women and men in public debates and discussions, both women and men in Pramuka Island appeared to participate in public discussions and trainings provided by the local government. From our interviews, we learned that several trainings had been organized by the government, such as cooking training for women, fish cultivation training for men, and tourism-related training for both. Despite the opportunities provided for women to attend public discussions and trainings, several women respondents expressed some constraints in participating at such meetings, especially when they also had multiple duties of rearing children and working as traders. A woman trader stated:

> The cooking training is often organised by the village government, they bring trainers from Jakarta, like a teacher, supervisor, in the field of cooking, and then we (women) in the neighbourhood will get a call. That (training calls) depends on the type of discussion itself, like fish cultivation, males; cooking, females; tourism, both male and female … I didn't get involved in the discussion, it was males … I also had to sell my stuff around the village, I had no time for the discussion sometimes. (Female 3, Trader)

These differences in gender roles, occupations, and practices evident in Pramuka Island have implications for how climate change-related impacts may affect men and women. Women's inability or reluctance to participate in training activities and public discussions, as seen in our interviews, reveal the pressures on their time as they balance multiple commitments of domestic responsibilities and income-generating activities. It also indicates the potential challenges of ensuring women's participation in other important activities, such as those involving governance and decision-making – deemed essential to bring about transformative change in society (see Kronsell, 2013).

5.5.2 Gendered Impacts of Reduced Fish Stock and Changing Weather Patterns

The Seribu Islands, like the rest of the country, have experienced decades of unsustainable development, as evident in the case of marine resources management (see Fauzi & Buchary, 2002). Under a political regime marked by "corruption, collusion and nepotism," "resources were heavily exploited, destructive fishing practices were widely used, and widespread degradation of the marine areas occurred" (ibid., p. 168). The continuation of many of these practices and their consequences are evident in Pramuka Island even now.

Impacts on Women In relation to fish resources in the Island, both women and men have noticed a decline in fish stock in recent years. This reduction has impacted livelihoods along gender lines. For example, in interviews, women referred to the impacts of fish stock depletion on their livelihood in terms of their financial stability and greater pressures on their time. The lack of fish stocks has reduced women traders' ability to supplement their incomes through selling of processed fish products in their stalls. In addition, the reduced fish catch has an impact on their domestic roles (especially the wives of fishermen), such as the food they cook for the family. Whereas previously they used to serve fish for their families from their husband's fish catch on a regular basis, they now often have to buy fish. Female respondents expressed how the fish depletion on the island impacted their livelihood, as follows:

> When they (fishermen) don't go fishing and don't get money, they will be reluctant to buy anything, maybe that's how it works, like today the selling is low. (Female 2, Trader)

> When the fish are lacking, like this time around, I don't have fish supply to sell (fish-based food products). I usually buy directly from fishermen, clean the fish, and put it in the refrigerator, it will stay good for 1 month, and I can sell open fire grilled fish for tourists. When I don't have stock of fish, well … (Female 3, Trader)

Destructive Fishing Practices For fishermen, the decrease in fish stocks in Pramuka Island had an impact on their fishing practices and the time they needed to catch fish. They were concerned about their income declining as the result of fish depletion and, hence, changed their fishing practices to attempt to stabilize their income. For example, they went fishing in areas that were farther from their own island (across provincial borders) and also tried to catch as many fish species as possible. These strategies, however, required some fishermen to spend more time on the ocean to find fish to catch (staying away overnight).

In addition, many of the fishermen we interviewed also elaborated on the use of harmful fishing practices by some fishers. They admitted that some fishermen on the Island were still using destructive fishing gear in order to obtain higher catch and incomes. The depletion of fish stocks in Pramuka Island combined with the use of

harmful fishing equipment (such as potassium and *muro-ami* net[2]) have put fishermen in a vulnerable situation through the lower fish catches and undermined people's income and well-being. One male fisher respondent described the implications of reduced income for family dynamics, with greater stress that comes from being unable to support the family including the possibility that women may divorce their husbands if they could not maintain an adequate income. This concern contributes to many fishermen's willingness to use harmful, but cheaper, fishing methods to earn more income, such as using decompressors as a substitute for an oxygen tank while diving despite knowing that it could harm their own physical health. Research on the use of decompressors for diving equipment among Jakarta and Seribu Island fishermen found that over 50% of the fishermen had experienced decompression sickness (DCS) in the form of headache, vertigo, movement dysfunction, visual disturbance, chest pain, vomiting, joint pain, neurological dysfunction, nausea, or convulsions, after they had used it three or more times a day (Wahab et al., 2008). A male fisher respondent referred to the experiences of another fisherman, as follows:

> Mr. Sarip's son was tempted by the money he would get by using it (muro-ami net and decompressor). The boss said, "I'll pay you this much just to dive and get fish", and after he dived (using decompressors), he got paralysed. Did the boss want to take the responsibility for it? No, I've paid you, he's paralysed until now, and he got divorced by his wife, I feel sorry for him, and he's got one child. (Male 9, Fisherman)

Seasonal Changes Beyond the aforementioned hardships and vulnerability of fishermen in Pramuka Island as a result of fish resource depletion, fishermen spoke about their perceptions of changes in weather and seasonal patterns that seemed to affect their fishing practices. They referred to unpredictable weather changes and believed the intensity and frequency of storms and cyclones had become stronger compared to their recollection of the past. Such changes affected their fishing schedules and, when they did decide to go fishing, heightened the risks they faced. As one fisherman said:

> In the past there were less (storms), and the wind had its own path … But now, sometimes the wind comes from the south and then hits from the west, like that … When we go fishing that could be troublesome, we could be trapped on the ocean. … My friends experience that one time, their boat was gone, only them with floats, thank God they were safe … (Male 9, Fisherman)

Aside from the fishery sector, changes in weather patterns affect the sustainability of trading activities, predominantly run by women who have few options other than trading because of their modest educational levels (Indrawasih, 2015; Babbitt et al., 2015). On Pramuka Island, women who ran stalls as a source of secondary income for their families normally began work early morning and finished in the afternoons,

[2] Pursell (2002) depicts muro-ami as a system of drive-in net fishing that involves encircling net together with pounding devices to scare fish into bag nets. The devices are pounded of the mid-level fish that school above the reef and bottom dwelling fish which can severely damage coral reefs.

although this would be extended during periods when there were many tourists arriving on the island.

Many of the women respondents referred to how changes in climate variables such as rainfall and seasonal patterns, and also some climate change-related hazards, including cyclones, strong winds and storms, impacted their stalls' physical condition as well as their trading activities. For example, unseasonal weather patterns, including unexpected rains and storms, have led to the postponement of the production of commodities they sell, such as fish crackers and seaweeds. One woman trader explained this as follows:

> It (the uncertain weather pattern) affects the production of my supplies, like when I'm making fish crackers, it needs a dry weather to dry them, because I use the sun to dry the crackers. When the weather is rainy and season is uncertain, it makes the process difficult … so I have to postpone the process. (Female 5, Trader)

Moreover, women traders believed that the changing intensity and frequency of storms and cyclones had had a negative impact on the physical condition of their stalls, especially stalls that were made out of delicate materials such as bamboo and fabrics. Recent tornadoes in Pramuka Island were identified by the respondents as having a higher intensity of wind, compared to their past experiences of tornadoes. Respondents reflected on the most recent strong winds on the island and how they differed from previous cases:

> Now it (storm) is more often compared to the past; that February storm was the worst, I've never seen a big storm like that since I was a kid, I've just seen big waves, usually in December, but that's all, not with strong wind like it was in February. (Female 3, Trader)

> Usually the wind was far, we could see the wind running on the ocean. Because it was distant, the storms didn't get a chance to go to the island … Now it's almost every year, since 2010, usually it's a tornado. In this island alone, there was a huge one in 2016, it destroyed the quayside's canopies, it was a tornado. Also, there was another tornado in 2017, all these stalls were wiped out, there, in front of those stalls, they were hit by the tornado. (Male 1, Fisherman)

Their statements are reinforced by reports from Hamonangan (2017) and Pribadi (2018), which reported the occurrence of strong winds and a tornado in December 2017 and February 2018 on the island. The report states that while bad weather is normal in Pramuka Island and its surroundings, the intensity of the winds has been stronger than usual lately. The high frequency and intensity of the strong winds have damaged infrastructure on Pramuka Island and caused financial loss from the damage. Such intense weather events consequently affected the women traders' ability to earn an income, as their shops were unable to operate during the period of wind and during the repairing of the physical damage. However, some women tried to sell their goods by using other techniques, which were considered to be more time and energy consuming, for instance, through pushing a cart.

> My stall was on the tree (blown by the wind) … I did not open my shop for 3 months, because of the wind … We are human, so use our brain to do something, I pushed cart to sell around the village, sell anything, coffee, instant noodles, anything. (Female 7, Trader)

From the view of female traders in Pramuka Island, climate change-related risks, including stronger and more frequent storms and uncertain weather patterns, have built up additional challenges to their daily life. The uncertain weather patterns have interrupted their commodity production schedule, while the intensified storms have demolished many women's stalls, with implications for women's income and time.

From the above discussion, it is evident that both women and men in the Pramuka Island are affected by the changes to seasonal weather patterns, which are likely to be linked to climate change-related impacts. While fish stocks are undoubtedly affected by the widespread use of destructive fishing practices (Fauzi & Buchary, 2002), climate change-related factors such as changing rainfall patterns, intensification of storms, and warming sea temperatures can affect both fishing practices and fish stocks. The reduction in fish catch has gender-specific impacts, negatively affecting women's and men's occupations, income-earning capacity, and their marginalization and vulnerability.

5.6 Analysis and Policy Implications

The gendered implications of climate change for Pramuka Island society are mirrored in other societies elsewhere in the world, although conceptions of gender vary across place and time and rely on the subjective and cultural meanings specific to a society (Kimmel, 1986). Nagel (2017) argues that the differentiated impacts and outcomes of climate change for men and women occur as a result of gender roles, citing examples from climate-related hazards in multiple countries, for example, cyclones, global warming, and sea level rise in Bangladesh, Australia, and the United States. In these countries, societal norms that prescribed how women should act had limited the mobility of women, which heightened their vulnerability.

The already vulnerable situation of Pramuka Islanders in consequence of the physical features (a low-lying and small island) and the current situation of environmental degradation, such as the fish stock depletion, is exacerbated by climate change. Decreased environmental quality can lead to an increased workload for both women and men, as well as an increase in their vulnerability, especially when resources are already scarce (Nelson et al., 2002). It is obviously difficult to separate the factors that are contributing to the declining fish population in Pramuka Island, which is one of the most significant food and income resources for the fishing community. However, climate-related risks have certainly aggravated the hardship experienced by the community from other environmental pressures on the Island.

In response to the falling fish stock, the government initiated a number of interventions to help the fishermen. According to the respondents, these included: developing artificial reefs made from bamboo for fish to grow, introducing new fishing instruments (sonar space, nets, fishing rod, rope), aquaculture, and mangroves plantation. Viewed as a climate change adaptation response, many respondents recognized them as a positive response to the decline in fish resources. But many of them expressed concern that policy implementation and access to benefits

were often discriminatory and inequitable. In addition, in an attempt to increase local communities' resilience to climate change, the local government has also employed a national climate adaptation program, namely the *Program Kampung Iklim* or Climate Village Programme (CVP). The CVP was launched in 2013 to support local villagers in adapting to the impacts of climate change (MoEF1) and includes assisting communities in building vegetable gardens to increase their food security, developing integrated waste management programs to lower carbon emissions, and organizing climate change awareness raising programs in Pramuka Island (SIEA1).

Although such initiatives hold promise, climate change impacts may pose barriers to women's involvement in collective decision-making in environmental governance due to a lack of available time and other constraints. In the context of Pramuka Island, women's multiple responsibilities on the domestic front and their local trading activities to support their families' financial earnings have a knock-on effect on their ability to be involved in community activities, such as village meetings or discussions. Wilkinson and Pratiwi (1995) argue that poor women's greater burdens restrict their ability to obtain information and to contribute to a community forum on environmental decision-making compared to men.

Yet, the significance of community participation in decision-making processes concerning development and environmental management has been generally recognized in the country, including in Pramuka Island. According to a representative of the Ministry of Women Empowerment and Child Protection of Indonesia, one of the opportunities for community participation in policy-making processes is the annual general meeting (or public hearing) where the government discusses its local development plans with communities at village, sub-district, and district levels (MoWE1). These processes aim to open up discussions for the local communities to contribute and share their views on development programs, including those concerning environmental resource management and climate change. Such public hearings and events are required to have at least 30% of their participants from women's groups (MoWE1). However, she acknowledged that it was difficult to ensure this given that even when women were present at such forums, they were not used to the processes and often unable to share their opinion (MoWE1). Such a lack of participation as this official describes is perhaps a reflection of sexist societal norms that devalue women's voices in public forums. It is also evident from this research that women are facing greater pressures on their time from climate change-induced stresses, such as the impact of lower fish catch and destruction of their stalls because of storms. In attempting to fulfill their domestic responsibilities while expanding their paid work of trading, there appears little time to participate in such government-run planning programs.

The absence of women's voices from such forums is a concern, both in terms of the implications for the substantive quality of policies and strategies developed and for its implications for justice. As widely acknowledged in the scholarship, it is critical to ensure the voices of women are present in processes of local environmental governance. Arora-Jonsson (2012), for example, emphasizes the importance of policymakers understanding how locals, especially women, experience and address

environmental change as it helps them avoid epistemic injustice through undermining knowledge produced by the locals, particularly women. The idea of justice is also highlighted by Moosa and Tuana (2014), who argue that the production and reception of climate change knowledge need to value the views of women for better appreciating the ethical dimensions of climate change. This ensures richer understandings of the impacts of climate change from the point of view of the marginalized groups to allow the formulation of more responsive frameworks in addressing climate change.

Local climate adaptation strategies and policies need to incorporate local perspectives from both women and men in the affected society to be effective. Nelson et al. (2002) argue that environmental change has different impacts on women and men, and the responses to these changes need to be gender-aware to prevent government policies and programs from exacerbating gender inequality within society. Government policies, therefore, need to include careful consideration of societal livelihoods and to consider the outcomes of any policy on gender and power relations in order to design strategies for adaptation that are responsive to the interests and needs of local communities (Nelson et al., 2009). Furthermore, MacGregor (2010) points out the urgency for a critical examination of the masculinist discourses underpinning gender and climate politics "that effectively exclude women from positions of leadership and citizenship and given them a choice of much less attractive discursive categories of victims, saviours or culprits" (MacGregor, 2010, pp. 235–236). She argues that ignoring the gendered discourses of climate change will result in unsustainable, unjust, and insufficient responses to address the issue. Thus, in developing a plan for adaptation to climate change risks in Pramuka Island, the consideration of women's and men's specific needs and interests, their lived experiences, and the recognition of the centrality of issues of "values, place, power, and narrative" (Munshi et al., 2020) will help develop more suitable and just strategies to reduce the negative impacts of climate change.

5.7 Conclusion

The findings from this study, showing how changes to resource availability and management and seasonal variability had distinct impacts and implications for women and men, are valuable for developing adaptation strategies to deal with climate change risks that are sensitive to local gender needs. The gender analysis revealed that women and men in Pramuka Island are not affected by the risk of climate change in the same manner, given their gender-differentiated forms of employment. For example, the reduction in fish stock over recent years has affected women and men differently with women traders unable to produce and sell fish products in their stalls. Men, on the other hand, have attempted to compensate for the depleting fish stocks by traveling further and spending more time at sea to increase their catch, while also resorting to more harmful fishing practices that negatively affected both their health and the coral reefs. This research also identified the shifts in fishermen's

fishing practices caused by the changing weather patterns and intensified natural/human-induced hazards. For women, however, these changes in weather affected their ability to sustain their trading activities given the demolition of their stalls during intense storms. Perhaps the most significant aspect of such differential impacts of climate change risks is that with increasing responsibilities to ensure the sustenance of their families, women have less time to participate in public discussions and community-level activities.

This study also provides insight into the complexity of climate change impacts on local communities, as many social factors intersect in shaping the experience of people toward climate change-related risks. There is increasing evidence demonstrating the importance of focusing on local adaptation contexts in addressing climate change issues. By focusing research, policy interventions, and governance more broadly on climate change to the specifics of particular places, we can incorporate the complexity of social structures, cultures, and values that exist within communities. Therefore, when developing climate change adaptation strategies for communities, the views and experiences of local women and men are critical to identifying the most appropriate ways in which to adapt to the changes because women and men often have different roles, values, and knowledge. It is also important to recognize that despite such differences, this research highlighted how climate change impacts affected family units, rather than men and women individually. For example, low fish catch translates to lower volumes of trading, which has implications for the income and economic sustainability of families. So, for climate adaptation strategies to work, men and women have to devise collective strategies. Such strategies require, most fundamentally, policymakers to recognize that meaningful action on climate change calls for systemic change by rethinking traditional, masculinist, and economistically informed approaches to development by centering gender and culture in climate change mitigation and adaptation. Ultimately, a commitment by the state to gender equity in political institutions by ensuring women's leadership and participation in democratic governance and policy decision-making at a multifaceted level is critical to creating inclusive and gender-sensitive policies on climate change that are responsive to individuals' and communities' specific needs and interests.

References

Agarwal, B. (1992). The gender and environment debate: Lessons from India. *Feminist Studies, 18*(1), 119–158.

Agarwal, B. (2010). *Gender and green governance: The political economy of women's presence within and beyond community forestry*. Oxford University Press.

Arora-Jonsson, S. (2012). *Gender, development and environmental governance: Theorizing connections* Routledge.

Arora-Jonsson, S. (2014). Forty years of gender research and environmental policy: Where do we stand? *Women's Studies International Forum, 47*, 295–308. Pergamon.

Babbitt, L. G., Brown, D., & Mazaheri, N. (2015). Gender, entrepreneurship, and the formal–informal dilemma: Evidence from Indonesia. *World Development, 72*, 163–174.

Boissière, M., Locatelli, B., Sheil, D., Padmanaba, M., & Sadjudin, E. (2013). Local perceptions of climate variability and change in tropical forests of Papua, Indonesia. *Ecology and Society, 18*(4), 13–28.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Bryman, A. (2016). *Social research methods*. Oxford University Press.

Caruso, R., Petrarca, I., & Ricciuti, R. (2016). Climate change, rice crops, and violence: Evidence from Indonesia. *Journal of Peace Research, 53*(1), 66–83.

Dankelman, I., & Jansen, W. (2010). *Gender and climate change: An introduction*. Earthscan.

Fauzi, A., & Buchary, E. A. (2002). A socioeconomic perspective of environmental degradation at Kepulauan Seribu Marine National Park, Indonesia. *Coastal Management, 30*(2), 167–181.

Firman, T., Surbakti, I. M., Idroes, I. C., & Simarmata, H. A. (2011). Potential climate-change related vulnerabilities in Jakarta: Challenges and current status. *Habitat International, 35*(2), 372–378.

Gaard, G. (2015). Ecofeminism and climate change. *Women's Studies International Forum, 49*, 20–33. Pergamon.

Hamonangan, J. (2017, December 1). Angin kencang rusak tenda dermaga utama Pulau Pramuka, warga minta desain dan bahannya diganti. *wartakota*. Retrieved from http://wartakota.tribunnews.com/2017/12/01/angin-kencang-rusak-tenda-dermaga-utama-pulau-pramuka-warga-minta-desain-dan-bahannya-diganti

Hubeis, A. V. S. (2010). *Pemberdayaan perempuan dari masa ke masa*. IPB Press.

Indonesian Agency for Meteorology, Climatology and Geophysics. (2018). *Climate change extreme*. Retrieved from: https://www.bmkg.go.id/iklim/?p=ekstrem-perubahan-iklim&lang=EN

Indrawasih, R. (2015). The productive role of women in several Indonesian fishing communities. *Jurnal Masyarakat & Budaya, 17*(2), 249–264.

IPCC. (2021). *Climate change 2021: The physical science basis. Contribution of working group I to the sixth assessment report of the Intergovernmental Panel on Climate Change*. Retrieved from https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport_small.pdf

IPCC. (2013a). *Climate change 2013: The physical science basis. Contribution of working group I to the fifth assessment report of the Intergovernmental Panel on Climate*. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WGIAR5_SPM_brochure_en.pdf

IPCC. (2013b). *Climate change 2013: The physical science basis. Working group 1 contribution to the fifth assessment report of the Intergovernmental Panel on Climate Change*. Retrieved from http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf

IPCC. (2014a). *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the Intergovernmental Panel on Climate Change*. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WGIAR5_SPM_brochure_en.pdf

IPCC. (2014b). *Climate change 2014: Impacts, adaptation, and vulnerability. Part B: Regional aspects. Contribution of working group II to the fifth assessment report of the Intergovernmental Panel on Climate Change*. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WGIAR5_SPM_brochure_en.pdf

Kimmel, M. S. (1986). Introduction: Toward men's studies. *The American Behavioral Scientist, 29*(5), 517–529.

Kronsell, A. (2013). Gender and transition in climate governance. *Environmental Innovation and Societal Transitions, 7*, 1–15.

Kurian, P. (2019/2000). *Engendering the environment? Gender in the World Bank's environmental policies.* Routledge/Ashgate.

Lawless, B., & Chen, Y. (2019). Developing a method of critical thematic analysis for qualitative communication inquiry. *Howard Journal of Communications, 30*(1), 92–106.

MacGregor, S. (2010). Gender and climate change: From impacts to discourses. *Journal of the Indian Ocean Region, 6*(2), 223–238.

MacGregor, S. (2019). Zooming in, calling out: (M)anthropogenic climate change through the lens of gender. In K.-K. Bhavnani, J. Foran, P. Kurian, & D. Munshi (Eds.), *Climate futures: Reimagining global climate justice* (pp. 57–63). Zed Books.

Miñarro, S., Forero, G. N., Reuter, H., & van Putten, I. E. (2016). The role of patron-client relations on the fishing behaviour of artisanal fishermen in the Spermonde Archipelago (Indonesia). *Marine Policy, 69*, 73–83.

Moosa, C. S., & Tuana, N. (2014). Mapping a research agenda concerning gender and climate change: A review of the literature. *Hypatia, 29*(3), 677–694.

Munshi, D., Kurian, P., Cretney, R., Morrison, S., & Kathlene, L. (2020). Centering culture in public engagement on climate change. *Environmental Communication, 14*(5), 573–581.

Nagel, J. (2017). *Gender and climate change: Impacts, science, policy*. Routledge.

Nelson, V., Meadows, K., Cannon, T., Morton, J., & Martin, A. (2002). Uncertain predictions, invisible impacts, and the need to mainstream gender in climate change adaptations. *Gender and Development, 10*(2), 51–59.

Nelson, D. R., West, C. T., & Finan, T. J. (2009). Introduction to "In focus: Global change and adaptation in local places". *American Anthropologist, 111*(3), 271–274.

PIAV (Panggang Island Administrative Village). (2018). *Monthly report Panggang Island Administrative Village for March 2018*.

Pribadi, A. (2018, February 2). Kena angin puting beliung, puluhan rumah di Pulau Panggang rusak. *wartakota*. Retrieved from http://wartakota.tribunnews.com/2018/02/02/kena-angin-puting-beliung-puluhan-rumah-di-pulau-panggang-rusak

Pursell, T. (2002). *The net, the fish and the child: The muro-ami system, transformation in coastal communities of southern Cebu 1900-2000* (Doctoral dissertation, Murdoch University).

Rinaldo, R. (2008). Envisioning the nation: Women activists, religion and the public sphere in Indonesia. *Social Forces, 86*(4), 1781–1804.

Sorenson, S. B., Morssink, C., & Campos, P. A. (2011). Safe access to safe water in low income countries: Water fetching in current times. *Social Science & Medicine, 72*(9), 1522–1526.

Statistics Kepulauan Seribu Administrative Regency. (2017a). *Kepulauan Seribu in figures 2017*. Author.

Statistics Kepulauan Seribu Administrative Regency. (2017b). *Kepulauan Seribu Utara in figures 2017*. Author.

Tickamyer, A. R., & Kusujiarti, S. (2020). Riskscapes of gender, disaster and climate change in Indonesia. *Cambridge Journal of Regions, Economy and Society, 13*, 233–251. https://doi.org/10.1093/cjres/rsaa006

Tickamyer, A. R., Kusujiarti, S., & Wornell, E. J. (2014). Gender justice, climate change, and sustainable development in Indonesia. In Z. Zhu, B. C. G. Teh, & S. Y. Tong (Eds.), *Globalization, development and security in Asia* (pp. 67–91). World Scientific Publishing Company.

van der Kaars, S., & Dam, R. (1997). Vegetation and climate change in West-Java, Indonesia during the last 135,000 years. *Quaternary International, 37*, 67–71.

Wahab, C., Budiningsih, S., & Guritno, M. (2008). Decompression sickness among Moroami diving fishermen in Jakarta. *Medical Journal of Indonesia, 17*(3), 197–202.

Widiyanti, W., & Dittmann, A. (2014). Climate change and water scarcity adaptation strategies in the area of Pacitan, Java Indonesia. *Procedia Environmental Sciences, 20*, 693–702.

Wilkinson, P. F., & Pratiwi, W. (1995). Gender and tourism in an Indonesian village. *Annals of Tourism Research, 22*(2), 283–299.

Wirawan, M. A. (2010). Public health responses to climate change health impacts in Indonesia. *Asia Pacific Journal of Public Health, 22*(1), 25–31.

Wong, P. P., Losada, I. J., Gattuso, J.-P., Hinkel, J., Khattabi, A., McInnes, K. L., et al. (2014). Coastal systems and low-lying areas. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, et al. (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 361–409). Cambridge University Press.

World Bank. (2020). *Indonesia – Overview*. https://www.worldbank.org/en/country/indonesia/overview

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Sage.

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Chapter 6
Coastal Forest Re-Grabbing: A Case from Langkat, North Sumatra, Indonesia

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Abstract Grabbing in its various forms, such as land and maritime grabbing, has been a global concern. This is not only because it happened in many places but also the negative impacts on local people and the environment were often severe. Studies found that millions of local people were excluded from their access to resources they depended upon for decades or even generations. In some places, environmental impact occurred beyond the ability of the ecosystem to recover. This paper will also deal with the above issues. Nonetheless, while most studies focus on grabbing and their socio-environmental impacts, this paper will demonstrate the process of "re-grabbing." This is how local community supported by NGOs and other agencies took back the control over the coastal mangrove forest taken and converted by a private company for palm oil plantation. This paper will explain the process and strategies employed by coastal communities in Langkat, North Sumatra, in resisting the palm oil plantation's presence that has impacted their fishing and coastal livelihoods seriously. Interestingly, one of the strategies was "destroy and rehabilitate." This is the destruction of coastal dikes and palm oil trees and the reestablishment of the mangrove forest. This strategy bears two results. The first is the recovery of the ecosystem, which supports the redevelopment of coastal livelihoods, the old and

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new. Second is the acknowledgment from the government on the fact that communities have rehabilitated the coastal mangrove well. This, in turn, has stimulated government to grand the communities the *Hak Perhutanan Sosial* (Social Forestry Right) to manage the designated forest. In conclusion, this paper will argue despite the fact that in most cases grabbing left the community and environment as the lost parties, with certain strategies the reality can be turned back for the favor of the communities and the environment.

Keywords Grabbing · Re-grabbing · Coastal forest · Langkat · Indonesia

6.1 Introduction

Land grabbing in various regions of the world targets forest areas and agricultural lands. Furthermore, it is considered a solution to the global food and financial crisis (GRAIN, 2008; Dell'Angelo et al., 2018). Multinational corporations, countries, and international financial institutions collaborate to increase efforts aimed to capitalize and privatize land management for both food and energy needs, as well as global financial strengthening.

GRAIN recorded 416 lands grabbing cases by foreign investors in 66 countries, which were carried out to enable the production of food. Furthermore, the land obtained amounted to 35 million hectares. Ecoruralis, an NGO based in Romania, provides a critical note that is not only limited to this problem but also talks about the grabbing of forest areas by extractive wood processing industries, mining companies, privatization of water sources, and expansion of palm oil plantations (Baker-Smith & Attila, 2016). This then minimizes the opportunities and access of the community to natural resources by changing the communal management of these resources (public goods) into commercial commodities (private goods).

Capitalization causes conflictual relations between state and corporations, which lead to the emergence of an elite minority group that manages the natural resources in the community (Baker-Smith & Attila, 2016, p. 5). In Indonesia, land grabbing is part of an agrarian conflict and has been going on for many years. The collaboration of state, corporations, and traditional elites since the colonial era has resulted in encroachment on agricultural land and introduction of commercial agriculture (Breman, 1986; Zanden & Marks, 2012) due to the expansion of palm oil plantations in the New Order authoritarian era (AGRA, 2010; KPA, 2018). Furthermore, it is believed that this is the right way to increase the economic value of the society, as well as absorb labor (Colchestester et al., 2006; Tadjoeddin, 2007).

Until 2008, the estimated land occupied by palm oil plantations was 14.33 million hectares, most of which (7.8 million hectares) were controlled by corporate groups (Directorate General of Plantations, 2018, p. 4). Furthermore, these groups were considered destructive because they accelerated the deforestation rate, marginalized communities, eliminated livelihood sources (Tadjoeddin, 2007; Aditjondro, 2011; Syafi'i, 2016), and caused many agrarian conflicts (KPA, 2018). The 2018

Agrarian Reform Consortium (KPA) report stated that 83 cases or about 60% of conflicts occur due to the expansion of palm oil plantation land permits that violate community rights to their land (KPA, 2018).

Land grabbing cases due to this expansion also occurred in Lubuk Kertang Village. It was carried out by encroaching on mangrove forests and has been going on for many years, even since the colonial era. In the early days, it was caused by the existence of oil and gas exploration activities, charcoal industry, and intensive shrimp farming, as well as the presence of palm oil plantation industries. This caused the elimination of livelihood sources, as well as led to conflicts involving subsistence small fishing communities and large corporations.

Due to the fact that the fishing community suffered from the conversion activities, they fought back in other to grab back the source of their livelihood. In the early days, the resistance movement was carried out sporadically, was disorganized, and only led to the replanting of mangrove trees in areas that had not been cultivated by the company. Furthermore, it was initiated by village community leaders and began to get the attention of younger groups, even though it was not sufficiently able to stop the rate of forest destruction and restore lost sources of livelihoods. In the last 10 years or so, this movement gets stronger, as the youth groups are now connected with several NGO networks, and are able to mobilize the strength of the fishing community; therefore, they can regain "grab-back" access to the forest area. In this context, this chapter will explain how the "grab-back" process is carried out. In-depth interviews, observations, and focus group discussions (FGDs) with actors were carried out to understand the processes and roles in consolidating resistance, which ultimately succeeded in not only regaining access to mangrove forests but also being recognized by the state through social forestry schemes. Furthermore, this research also determines the extent to which this access gives them the opportunity to rehabilitate, conserve, and restore the livelihoods of fishing communities.

6.2 General Social–Political Context

In Indonesia, land grabbing has been going on since the colonial era, especially after the Agrarische Wet (AW) publication in 1870. Agrarische Wet then became the basis for economic liberalization policies that opened opportunities for corporations to increase the productivity of export crops (commercial agriculture). Furthermore, it has resulted in the rapid conversion of land for plantations, especially in Java and Sumatra.

The land grabbing process continued until post-independence, especially in the New Order era (1967–1998). During this period, land change, which was later indicated as land grabbing, was carried out through methods such as Green Revolution scheme, Business Use Rights (HGU), Forest Planning Rights (HPH), Industrial Plantation Forests (HTI), national park area determination, land tenure mining through the contract of work mining concessions, as well as concentration of land control for infrastructure development, including that of the military, and

settlements (property) (Alliance for Agrarian Reform Movement, 2010). This land grabbing activity began around the 1970s and greatly increased later on due to that massive land changes could not be separated from the transmigration program, which became the world's attention in the 1980s (Pagiola, 2000). Furthermore, transmigration involves the relocation of residents, especially from the Java and Bali islands to other areas such as Sumatra and Kalimantan, and it has an impact on forest clearing for agriculture and plantation businesses. The success of this program then prompted many other spontaneous transmigrants to move along.

Pagiola (2000) explained that in the 1980s, the government began to implement a diversification policy for commodities other than oil and gas by increasing expansion in plantation crops. This is made possible by the existence of a centralized state policy that regulates forest area management through the Industrial Tree Crop Estate (HTI). HTI initially used degraded land, but in practice many companies holding concessions carried out encroachment on forest areas. For the government, forest conversion for palm oil plantations is considered an alternative way to increase the economic value of the community because of its ability to absorb a lot of labor (Colchestester et al., 2006; Tadjoeddin, 2007).

In line with the changes in centralized government characteristics, Law No. 22 of 1999 as amended by Law No. 32 of 2004 concerning regional governance allows forest areas to be managed region by region. This aims to provide wider opportunities for regions to organize themselves based on the principles of equality, justice, and diversity in order to realize regional welfare. However, the decentralization practice as a manifestation of democratization and globalization has actually created contestation between elites at the national and local levels in fighting over access to natural resource management (Hadiz, 2010).

Land concession permits are increasingly issued by local governments and tend to be uncontrolled, therefore resulting in an increasing rate of deforestation. The Indonesia Corruption Watch (ICW) report stated that investment licensing in the natural resources sector is most often issued before the local electoral event. Furthermore, it stated that the gratification practice by regional heads to fulfill high political costs ahead of local elections is directly proportional to the number of regional heads that have been caught in a sting operation (OTT) by the Corruption Eradication Commission (KPK) (Kompas, 2017).

Decentralized practices in Indonesia ultimately tend to be directly proportional to the increase in deforestation rate. This is due to the fact that many regional heads opt for fast ways to benefit from forest utilization, including through mining, plantation, energy, and infrastructure permits. The aspect of sustainability, which is part of the aims of decentralization, has been ignored; therefore, it not only causes ecological disasters but also increases social conflicts. This extreme situation then forced the government to restructure decentralization practices through a law on new local governments (Law No. 23 of 2014).

In Law No. 23/2014, the governor as a representative of the central government becomes a central point of forestry affairs where the district/city government no longer has authority except for the management of the Grand Forest Park (Tahura). Considering that forestry management in this law has moved to the province,

several authorities related to proposals and technical considerations also fall under the province authority. After the implementation of this law, all forest management functions at the site level came under FMU management, starting from planning and implementing activities for utilization, rehabilitation, forest protection, and conservation. FMUs also carry out a service function to the community for utilization of forest resources (Putro & Nawir, 2018), including being responsible for resolving problems, such as conflicts and third-party rights claims (Steni, 2016). In this context, the absence of authority possessed by the district/city government makes them tend to be apathetic and unwilling to be responsible for issues on natural resource management in their area (Putro & Nawir, 2018).

During the decentralization period, collaboration between the State, corporations, and international financial institutions allowed for the massive expansion of palm oil plantation concessions. This situation places Indonesia as one of the countries with the largest palm oil plantation area, reaching 14.33 million hectares (Indonesian Plantation Statistics, 2018). However, this expansion not only increases deforestation rates but also marginalizes community groups, eliminates livelihoods, and creates potential conflicts (Tadjoeddin, 2007). The Consortium for Agrarian Reform (KPA) report stated that in 2018, there were 410 cases of agrarian conflicts in various provinces in Indonesia, with the most (35%) occurring in the plantation industry. Furthermore, of all the plantation-related conflict cases, as many as 60% occurred as a result of the expansion of this plantation's land permits, which violated the community's rights to their land (The Consortium for Agrarian Reform, 2018).

In North Sumatra, the expansion of the palm oil plantation industry has resulted in forest destruction and scarcity of local foodstuffs and threatens the existence of protected animals (Aditjondro, 2011). The coastal forest areas of the Lubuk Kertang Village, West Brandan District, which is located in the Langkat Regency, North Sumatra, is one of the areas where mangrove forests have been converted into palm oil plantations. This conversion, including the utilization of forest lands for the development of shrimp ponds in the 1980s, has been going on for many years, according to various historical records. The results of the research conducted by Basyuni et al. (2018) show that during the 1990–2006 period, 51.5 ha of mangrove forest lands were converted into shrimp ponds. However, over time, the ponds managed by communities did not yield much profits; therefore, they went bankrupt. Also, those owned by individuals were sold off illegally to palm oil plantation companies because the business lands were state forest areas.

The expansion of the mangrove charcoal company by PT Sari Bumi Bakau, which began in 1999, has further increased the rate of destruction of mangrove area. Although in 2006 the company was closed by the Ministry of Forestry, Indonesia, it sold off its mangrove forest concession to an palm oil plantation company. This company then expanded into the register 8/L area, which is a protected area that has been established since the Dutch colonial era. Therefore, its activities greatly disrupt the villagers and their surroundings, whose source of livelihood is fishery.

Lubuk Kertang is not a homogeneous village because it has a lot of potential that has not been utilized optimally, including rainfed rice fields and mangrove areas

besides palm oil plantations that have recently emerged (Lubuk Kertang Village Profile, 2018). This mangrove has great potential as fishermen in this village depend on it for their economic resources directly or indirectly (Sari, 2012). Its direct benefits are that it serves as a nursery, feeding, and spawning ground for various types of fish, shrimp, and other marine biotas, as well as being a supplier of fish larvae, shrimp, and a site for tourism. At the same time, its indirect benefits are that it serves as a storm and wave breaker, offers protection against abrasion, and is a mud retardant, a natural filter for organic waste, and a sediment trap (Arief, 2003). The presence of palm oil plantations in areas that were initially part of this forest has marginalized community livelihoods, as villagers use the tributaries (*paluh*) that flow in it as a source of wealth. *Paluh* is a breeding ground for marine life, such as various types of fish, shrimp, and mangrove crabs, which have high economic value, and fishing in it is an activity that has been carried out by the coastal community of this village for many generations.

Land grabbing involved logging of mangrove forests to be replaced by palm oil plantation. In order to maintain the survival and extent of palm oil plantations, companies seal creek*s* (*paluh*) by making embankments to block seawater flow to the plantation area. These embankments are usually of heights ranging from 2 to 4 m, with widths of about 4–6 m. The problem is that this closure causes the creation of seawater puddles when the tide rises. Previously, the occurrence of rising tides only entered the *paluh* and inundated the mangrove swamp, while bringing various marine biota, which then reproduced. The overflowing water that was held back by the embankment flowed to a lower landscape, hence inundating residential areas and the rice fields. In 2009, the impact of this event was felt greatly by communities, especially the Lubuk Kertang village, as there was serious flooding due to the massive expansion of palm oil plantations (Ompusunggu, 2018). This land grabbing phenomenon changes the community's economic structure, as most of the villagers depend on fishing businesses. Logging of mangrove forests and closing of *paluh* by creating embankments have changed the coastal ecosystem, as well as caused loss of livelihood for fishermen. Furthermore, agricultural areas around *Paluh* often experience crop failures when high tides occur.

Mangrove forests that previously protected agricultural areas have disappeared, causing intrusion and standing of seawater that has damaged rice plants. This has led to the scarcity of economic resources and, consequently, the emergence of social problems such as the development of client–patron relationships. Due to poor economic conditions, small fishermen are often indebted to the business owners, and this has led to the creation of asymmetrical relationships. According to Kusnadi (2000), this relationship can easily turn into a means of dominance and exploitation. Another option is that when fishing or farming does not provide the necessary funds for day-to-day activities, some villagers choose to become workers in palm oil plantations, which is relatively new to them, while some others choose to migrate to cities, where they carry out odd jobs, as unskilled labor, since they lack crucial skills.

6.3 The Development of Palm Oil Plantation and the Socio-ecological Impacts: The Grabbing

The mangrove forest conversion in Lubuk Kertang Village has been going on for a long time, even since the pre-independence era. Furthermore, the exploration of oil and natural gas carried out by the colonial government is an early marker of this conversion activity. Until today, the state oil and gas company, Pertamina, controls the area. In more recent times, land conversion in this area, which led to land grabbing activities, began in 1986 with the creation of shrimp ponds (Saragih, 2018). However, these ponds did not yield much profit; therefore, their production went on a steep decline, and this caused many farmers to sell off their ponds to palm oil plantation companies.

Almost simultaneously with the shrimp pond expansion, mangrove areas were also converted for charcoal-making industrial activities. The company that has obtained the concession permit is Sari Bumi Bakau Ltd. (PT. SBB), and through the decree from the Indonesian Ministry of Forestry, which is now the Ministry of Environment and Forestry, with Number 934/kpts-II/1999, this company obtained a Business License for the Utilization of Timber Forest Products in Plantation Forests (IUPHHK-HT), formerly known as forest concessions (HPH). Furthermore, on October 14, 1999, it obtained a mangrove forest concession covering an area of 20,100 ha, out of which 155.2 ha were in Lubuk Kertang Village (Saragih, 2018). The expansion of this company then caused mangrove forests deforestation in Langkat Regency to become more widespread, and it has even occupied an area that was initially an animal reserve (Sonjaya, 2007). This was carried out because the raw material for making charcoal from mangrove logs in their concession area had run out; therefore, the area needed to be expanded.

In Lubuk Kertang Village, the company that “bought” the concession was KUD Harapan Sawita, occupying a land area of approximately 850 ha. Furthermore, another company, by the name, Pelita Nusantara Sejahtera Ltd. (PNS), also received a concession area of 42 ha. Both companies obtained land from a sale made by KUD Mina Murni (Saragih, 2018). In the past, the land was not obtained through this means. It was got when citizen identities (KTP) were obtained and used to claim the 2 ha of land due to each of them. In addition, any citizen who was able to claim back the land was compensated with 2–3 million rupiah. This is supported by Onirizal (2015) who states that the company’s main mode is to take advantage of community claims toward inherited land, which is then sold to them regardless of the area being considered a protected forest. Meanwhile, the practice of collecting KTP is carried out by KUD Mina Murni in order to give the impression that the village head and residents are legalizing the sale of the land, which in fact belongs to the state.

The success of this practice then perpetuates the palm oil company from completely converting mangroves into plantation areas. This was followed by a dam-building activity by the company to prevent seawater from entering the acquired forests, which are now occupied by palm trees. Consequently, this practice has

certainly disrupted the ecological system on the coast of the village and has caused fish and crustacean resources therein to decrease significantly. This is felt by the fishing community not only in this village but also in the surrounding villages that depend on proceeds from fishing in the mangrove area. Preceding this conversion, fishermen were able to earn up to 2–5 million rupiah monthly, but as it stands, they only earn about 500 thousand rupiah. Some of them were even forced to migrate to Aceh Province and work in the informal sectors.

Fishermen were not the only ones to suffer from this conversion, and forest honey seekers also had their fair share. According to Azhar, a community leader, before the expansion of palm oil plantations, forest honey seekers could produce about 200–300 l of honey yearly. As an additional note, the destruction of mangrove forests in Lubuk Kertang Village not only eliminated their livelihood source but also caused the flood disaster in 2009 (Ompusunggu, 2018). This flood made the community more aware that their environment had been damaged due to the mangrove forest conversion to palm oil plantations.

6.4 Community Resistance to Palm Oil Plantations: Coastal Re-Grabbing

The mangrove conversion has an impact to the fishermen livelihoods not only in Lubuk Kertang Village but also in other villages such as Perlis, Klantan, Lubuk Kasih, Sungai Bilah, Brandan Barat, and Pangkalan Batu. These communities live across three sub-districts, namely Brandan Barat, Sei Lepan and Babalan Subdistrict. After large-scale land conversion, fishermen's income decreased dramatically, as well as some other livelihood sources such as forest honey seeking and farming due to seawater intrusion and tidal flooding. This triggered the migration of some of these individuals to other areas, especially in big cities in Sumatra, to become unskilled laborers or rickshaw drivers.

The coastal ecosystem damage and the loss of livelihood sources have made the communities that depend on mangrove forests to fight back. This resistance involved not only the individuals that chose to remain in the communities but also those that had migrated to the big cities. They all teamed up to be involved in the "grab-back" movement of the mangrove areas controlled by the company. In this context, the resistance carried out by fishing communities is part of postcolonial environmentalism. Cao (2015) stated that postcolonial environmentalism is a citizen's struggle to get out of poverty that occurs in the southern region due to the transnational economy expansion from the north.

Initially, the resistance movement did not directly challenge the company. It was carried out clandestinely and individually by the cutting down of grown palm oil trees, or the entering of mangrove areas controlled by companies, in order to find old commodities, such as crab, shrimp, and fish (interview with Azhar Kasim, 2018). Scott (1976) mentioned that it was the daily resistance of a person or farmer

groups, or in this case fishermen, against corporate and state hegemony that threatens their subsistence economic structure. Another form of resistance was the mangrove rehabilitation in concession areas, which had not been cultivated by the company. Abdul Jalil and Amat Ali are two community leaders that started voluntarily rehabilitating mangroves in damaged areas. This was carried out to overcome the direct impacts of conversion such as seawater intrusion, tidal flooding, sedimentation, and the loss of livelihood sources (interviews with Amat Ali and Hadian, 2018). However, these rehabilitation efforts have not been able to stop the mangrove destruction rate.

Inspired by these two figures, the community then began to gain strength by establishing groups to increase the rate of rehabilitation. The Mekar and Keluarga Bahari Mangrove Farmer Groups were established in 2005 and 2007 respectively, became the forerunners of groups that gained access to forest management through social forestry schemes. These two groups then continued to control the rehabilitation movements by involving many other stakeholders. In the end, the rehabilitation efforts carried out by the community were not optimal for restoring the mangrove forest function, at least until 2012. This is because the expansion of palm oil plantations was still ongoing; hence, its ecological impact continued to be felt by the community. This incident prompted two groups, Mekar and Lestari Mangrove, to openly fight against the company. Young figures such as Hadian (Mekar Group), Azhar Kasim, Tajjrudin, and Rohman (Lestari Mangrove Group) then began to amass mass power and networking, not only with the local government but also with several NGOs involved in advocating for this movement. This context is relevant to Ostrom (1990), as it suggests that in 8 rules managing the common, resource management will work best if it is associated with a larger network. Indeed, for several things, Ostrom stated that resources could be managed locally, but in order to achieve goals in managing common pool resources, including mangrove areas, it is important to create a network in a regional context. Eventually, what these young leaders do is a guarantee to strengthen and ensure that they are involved in managing these mangrove resources.

In the context of the resistance movement, Azhar Kasim and Tajrudin Hasibuan (Indonesian Traditional Fishermen Union/*KNTI*) as well as M Iqbal and Sahrul Pasaribu (North Sumatra *Walhi*/Indonesian Forum for the Environment) were young leaders that were driving for the reorientation of the resistance movement strategy. They already had networks with various stakeholders and succeeded in gathering the masses to carry out direct and open resistance movements against the company. Some forms of resistance that they used include logging of palm oil trees and exploiting mangrove areas controlled by companies that have been quietly abandoned. They then consolidated the fishermen's strength, both nets, torch, ambai, and trawl fishermen that were increasingly pressed due to the mangrove land destruction to seize and restore the socio-ecological functions of the mangrove area.

The resistance leaders did not only succeed in carrying out mass mobilization, but also they succeeded in consolidating networks with several NGOs working on environmental (*Walhi*), coastal community (Kiara and KNTI), and related legal issues (Medan Legal Aid Institute (LBH)) later on. Through this network, from

2009 to 2010, the breakdown of clay dams made by palm oil companies, which had been used to prevent seawater from entering the plantation area, was a manifestation of the resistance to the company. This caused seawater to rise again and kill existing palm trees. These dams were located on the Register 8/L area, which was illegally created by the company. In this case, the networks that were built during the resistance against the company and after are mapped in Fig. 6.1.

The company did not just sit back and watch the resistance groups destroy them. They made efforts to criminalize and intimidate the leaders of the groups. Azhar Kasim, Tajruddin, and Rajali are the figures reported by the company to the police for damages. However, this did not discourage resistance because the network that had been formed made them strong in dealing with the company. Their resistance was not only limited to mass movements in the field but also succeeded in raising other issues such as legal issues, community welfare, and the environment. The criminalization of the company against the three figures was not entirely successful. In 2012, this movement succeeded in re-grabbing a 325-ha mangrove area that was previously an palm oil plantation.

The Mekar group continues to consistently carry out environmental rehabilitation, so also do the other group. A year after being founded, they received assistance from the Forestry and Plantation Service at Langkat Regency through the National Movement for Forest and Land Rehabilitation (Gerhan/GN-RHL) program. This program succeeded in replanting in an area of 25 ha. Two years later, the same program was carried out again in the same area as in 2006. In 2010, this group independently planted on 55 ha of mangrove land. Then in 2012, together with the success of the "grab back," they and the Sumatran Elephant Foundation (Yagasu), a local CSO, returned to planting in the same area, in the previous location. Furthermore, Yagasu helped formulate regulations on village-based mangrove forest

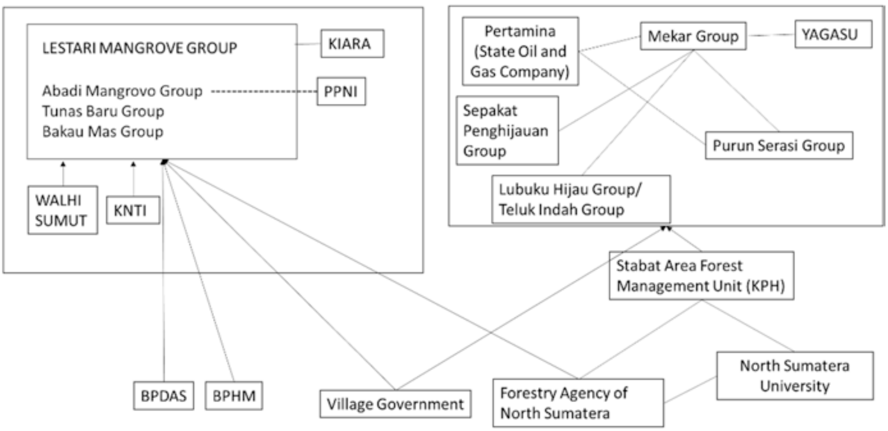


Fig. 6.1 Mapping of actors is an effort to strengthen community groups in re-grabbing. (Source: Processed based on the results of a focus group discussion with the actors involved and field observations, 2018)

management, construction of information huts, and the boundaries of the Mangrove Protected Area Forest (DPM). This activity was the beginning of ecotourism development in the mangrove area in this village.

The Keluarga Bahari Mangrove Farmer Group later changed to the Lestari Mangrove Group (2011), and since then, it has been building stronger networks with state institutions. This effort was actually an adaptation to suit the country's structure. The goal was to make obtaining mangrove seeds easy, therefore increasing the ease of rehabilitating the land area ("Azhar Kasim's Testimony," 2017). In its development, especially after the success of the movement, this change was carried out to initiate efforts that grant access to forest management and are legalized by the state through social forestry schemes.

Initially, from a total of 325 ha, which resulted from the "grab-back" movement, in 2012, Lestari Mangrove planted in 25 ha of mangrove, with seeds obtained from BPHM (Mangrove Forest Management Office) Region II Medan. Rehabilitation then continued in another area of 15 ha with seedlings provided by the Ministry of Environment. The rehabilitation movement continues, and the areas that have been successfully planted have expanded. This is inseparable from many stakeholders that were involved during 2012–2014. Pertamina, for example, the state oil company, helped in planting in an area of 60 ha. Furthermore, another stakeholder, by the name, BPDAS Wampu Sei Ular, helped plant in an area of 183 ha. Also, Kompas-BRI and Pertamina EP did the same in 8 ha. Figure 6.2 shows changes in land conditions from planting seedlings (2012) and conditions in 2018.

The success of the Mekar and Lestari Mangrove Group through young leaders in rehabilitating and reclaiming management of mangrove forest areas has an impact not only on the return of their livelihoods but also on conservation efforts to restore the ecological function of mangrove areas. The group's consistency in rehabilitating, fighting, and utilizing mangrove forests in a sustainable manner then received recognition from the state through granting concessions for mangrove forest management in social forestry schemes. In 2014, the rehabilitation efforts carried out by the community reached 700 ha (interview with Tadjrudin, 2018). Although in records, converted areas between 1999 and 2012 amounted to 7000 ha. Based on the existing condition, there are still many palm oil plantations side by side in contrast to the mangrove forests that have begun to be successfully rehabilitated.

6.5 Social Forestry Program: Future Forest Management to Enhance Community Welfare

Based on the experience in Lubuk Kertang, the community needs a long and tiring struggle in order to gain access to the mangrove forest management in their area. Their resistance to taking back the forest area that has been converted is to restore not only the forest ecological function but also their lost livelihoods. The resistance movement and actions carried out by fishermen's communities in Lubuk Kertang

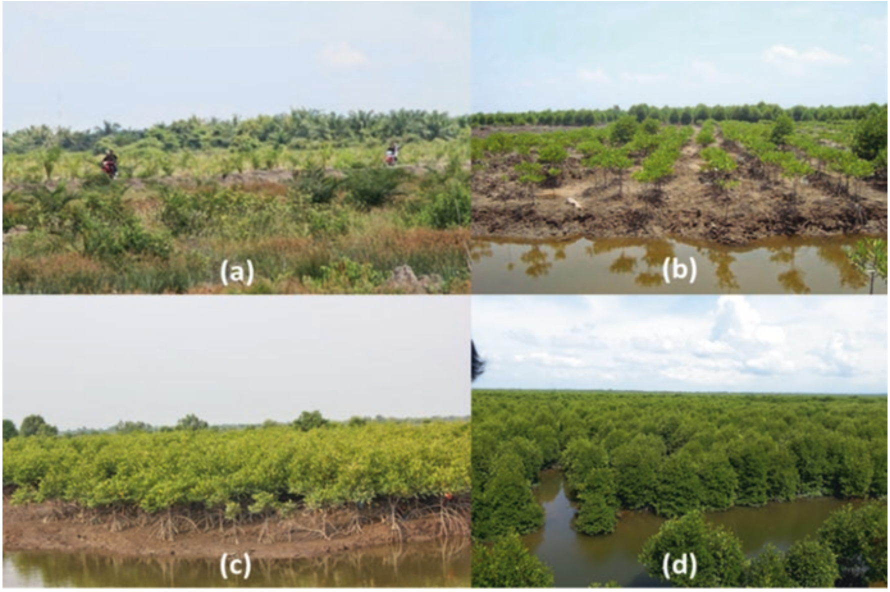


Fig. 6.2 Rehabilitation of Mangrove Forest in Lubuk Kertang. (**a**) Land conditions before rehabilitation, (**b**) rehabilitation by planting mangroves in 2012, (**c**) planting yields in 2012 reviewed in 2014, and (**d**) current condition of mangrove forests (2018). (Source: http://mangrovelangkat.blogspot.com/p/perkembangan.html (Mangrove sustainable group archives, figures, **a**, **b**, and **c**) & author (figure **d**))

Village provide an understanding that the role of the community in natural resource management can be a solution not only to overcome poverty due to marginalization but also to impact environmental conservation. In line with this, the World Bank (2008) emphasizes the importance of understanding, articulating, and subsequently accommodating local wisdom and traditional institutions in forest governance. To realize this, in 2016, the government through the Ministry of Environment and Forestry launched the social forestry program. This program aims to provide space for community-based forest management to not only improve welfare but also resolve uncertainty and injustice in land tenure, which often creates conflicts.

Basically, the social forestry concept is implemented in the form of granting forest management permits to local or customary law communities in the form of five schemes such as Village Forest (HD), Community Forest (HKM), Community Plantation Forest (HTR), Community-Privately Owned Forest (HR), and Forestry Partnership. Until 2018, this program has granted management and utilization rights on an area of 1,558,453.58 and 969,215.18 ha for HKM, 99,709.87 ha for HTR, 102,000.08 ha for partnership forest, and 22,435.59 ha for a Social Forestry Utilization Permit (IPHPS), as well as an area of 27,950.34 ha for Customary Forest (Ministry of Environment and Forestry, 2018) (Fig. 6.3).

In fact, the social forestry scheme not only places the community as the main actor in its management but also has a positive impact on the area development,

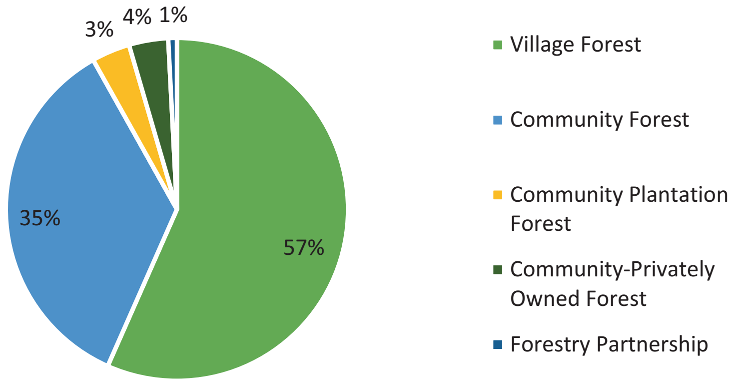


Fig. 6.3 The access division in social forestry schemes. (Source: Ministry of Environment and Forestry, 2018)

from an economic, social, and environmental perspective. This can be seen in the Beringin Community Forest (HKM) in Lampung, where they were able to reduce the rate of land cover loss, improve welfare, and reduce inequality between communities. Furthermore, there is also Kalibiru Independent Farm Community Forest at Yogyakarta, which focuses on managing ecotourism. This establishment can generate more than 300 million rupiah monthly and absorb workers from three surrounding areas; therefore, income distribution can be felt in the buffer areas.

In Lubuk Kertang Village, the existing social forestry scheme includes forestry partnerships and community forestry. The inauguration of the two social forestry schemes for the two groups that have been consistently fighting for sustainable mangrove forest management, such as the Lestari Mangrove and the Mekar Groups, has real implications for the community's socio-economy. The Sustainable Mangrove group obtained a community forestry permit based on SK.987/MenLHK-PSKL/PKPS/PSL.0/2017 in March 2017, with a land area of 410 ha. Community forest management is carried out through core activities in the form of cultivation development with a silvofishery system. Meanwhile, the Mekar Group is engaged in developing ecotourism activities through a forestry partnership scheme based on the Decree of Recognition and Protection No: SK.1671/MenLHK-PSKL/PKPS/PSL.0/4/2018.

In the social context, the granting of this permit provides space for the community to manage forest areas that dominate their village, based on their potentials. It is not only the development of ecotourism and silvofishery-based cultivation that creates sources of livelihoods, but the return of mangrove function and broad access to the community also allows for the development of livelihood sources that were lost during the conversion, such as fishermen and honey seekers. This shows that there is a change in the social structure because there are now opportunities that ultimately provide a more decent livelihood, economic improvement and other multiplier effects in the form of job creation, environmental preservation, enhancement

of human resource capacity, and strengthening of group institutions. Figure 6.4 shows a map of mangrove management using a social forestry scheme.

It is undeniable that there are things to be anticipated in the management of the social forestry scheme in the future. The experience in Lubuk Kertang Village, where various groups that previously carried out re-grabs and gained access to management through social forestry schemes, actually raised other problems, further supporting this claim. In this village, the existence of several social forestry schemes in one area, which is administratively located, created a new conflict between them. One of the reasons is that there is no specific institution at the village level regulating joint management between existing social forestry schemes. Although this is not regulated by a ministry, the existence of a joint regulation at the village level is important to reduce conflict between groups and at the same time strengthen communication between them in developing potential management of the area.

The re-grabbing background in Lubuk Kertang, which involved many groups, not only created the Lestari and the Mekar Groups, which currently have access through the PS, but also groups in the process of applying for social forestry schemes. Therefore, the communication forum between groups at the village level is very crucial. This condition makes relations between group actors lead to new potential conflicts. Moreover, the output produced by each group of forest managers is almost the same; hence, it tends to be ineffective and prone to disputes. This problem arises due to social jealousy, limited knowledge, and understanding of the social forestry types, as well as the weak role of village stakeholders. Therefore, various

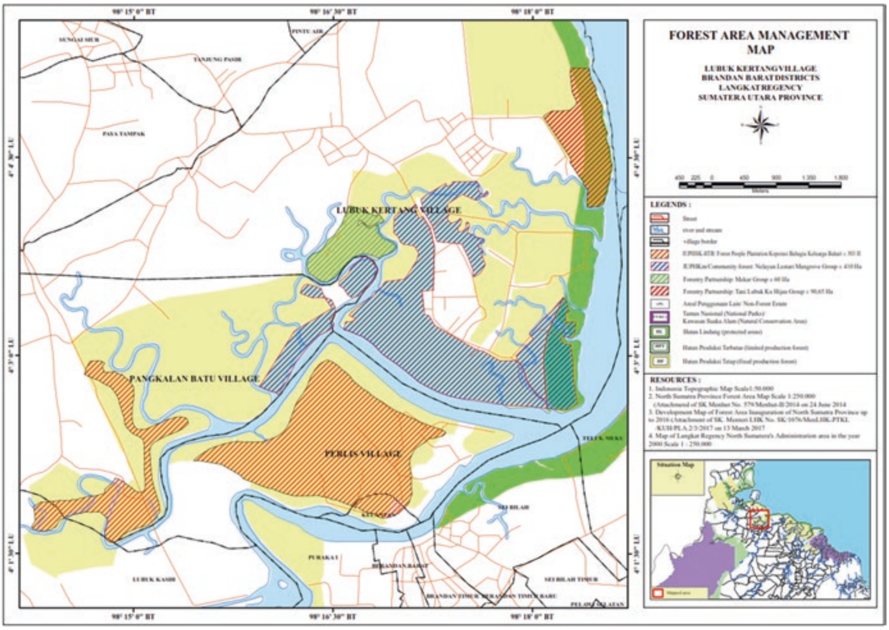


Fig. 6.4 Map of social forestry in Lubuk Kertang Village. (Source: Stabat forest management unit (KPH) archives)

strategies are needed to overcome the problems. The strategy that can be carried out is the formation of institutions at the village level that are able to cooperate in managing and utilizing mangrove forests to improve community welfare. In the future, it is hoped that a village forest can be formed to accommodate people that have not joined the forest management group managed by a Village-Owned Enterprise (*Bumdes*).

Based on input from local community leaders and related stakeholders, LIPI (Indonesian Institute of Sciences) promotes the Lubuk Kertang Village Government as the regional power holder to formulate a Village Regulation that is able to "cover" mangrove management activities. Furthermore, with the involvement of this government without overstepping existing social forestry regulations, it is hoped to be able to synergize the utilization while maintaining the mangrove ecosystem preservation and promoting active participation of all community groups. In realizing an institution based on village regulations, synergy with government agencies such as the Stabat Forest Management Unit (KPH) Region I, the Langkat Regency Marine and Fisheries Service, and NGOs such as KNTI and Walhi is needed. The presence of LIPI also helps in implementing this strategy.

6.6 Conclusion

This chapter has discussed the process of re-grabbing or grab back of coastal mangrove forests by the local community in Lubuk Kertang, North Sumatra. In so doing, it starts with the discussion of the grabbing and its socio-environmental impacts, followed by the process of re-grabbing or grab back. In this conclusion, we would like to highlight several factors that led to the success of the re-grabbing. We believe that these factors are very important as a lesson learnt for comparative future studies as well as for understanding the barrier and enabling factors for such a movement.

First, we believe that severe socio-ecological impacts were one of the drivers that have united the majority of the communities. The serious level of hardship people experiences because of the conversion of the ecosystem from mangrove forest to palm oil plantation produced a common sentiment of being as a victim. Thus, despite the politics "divide and control" run by the company, the majority of community members were united and formed a strong resistant movement.

Second, the community resisting strategy of "destroy and rehabilitate" was another key to success. This strategy produced several benefits. The destruction of the palm oil trees, the dike, and the replanting of mangroves have rehabilitated the ecosystem, supporting the rebuilding of community livelihoods. Community's concern for the ecosystem has attracted NGOs that share the same concerns to join the resistant movement. This has stimulated the growth of the movement beyond the community. In fact, with the help of media, it has become national news, attracting the attention of a much wider public. The last benefit is that the success of the mangrove rehabilitation has attracted government attention, which at the end granted the community the right to manage the mangrove forest.

Third, the alliance of the community with NGOs and media is also an important enabling factor for the success of the community grab-back. It was the alliance of community, NGOs, and Media that increased the leverage of the resistance movement from community-based and local to a collaborative national movement. We believe without such an alliance, the political power of the company was still beyond the community's capacity to get rid of. We believe it was because of the alliance that the company was being able to be brought to justice.

The final point is government support. The granting of forest management rights to the community has provided certainty on tenure over the area and the resources therein. This is the seal for the community to really be able to grab back the mangrove forest.

References

Aditjondro, G. J. (2011, April 13). *Bisnis Pahit Kelapa Sawit. Harian IndoPROGRESS*. Retrieved from https://indoprogress.com/2011/04/bisnis-pahit-kelapa-sawit-1/ and https://indoprogress.com/2011/04/bisnis-pahit-kelapa-sawit-2-selesai/

Aliansi Gerakan Reforma Agraria (AGRA). (2010, September). *Perampasan Tanah: Sebab, Bentuk dan Akibatnya bagi Kaum Tani [doc]*. Retrieved from https://www.farmlandgrab.org/wp-content/uploads/2010/09/Risalah-ttg-Perampasan-Tanah_24-Sept-2010.doc

Arief, A. (2003). *Hutan Mangrove: Fungsi dan Manfaatnya*. Penerbit Kanisius.

Baker-Smith, K., & Attila, S. B. M. (2016). *What is land grabbing? A critical review of existing definitions*. Ecoruralis.

Basyuni, M., Fitri, A., & Harahap, Z. A. (2018, March). Mapping and analysis land-use and land-cover changes during 1996-2016 in Lubuk Kertang Mangrove Forest, North Sumatera, Indonesia. *Proceedings of Friendly City 4 'From research to implementation for better sustainability'*. IOP conference series: Earth and environmental science 126 012110.

Breman, J. (1986). *Penguasaan Tanah dan Tenaga Kerja di Jawa Masa Kolonial*. LP3ES Indonesia.

Cao, B. (2015). *Environment and citizenship*. Routledge Taylor and Francis Group.

Colchestester, M., Andiko, J. N., Sirait, M., Firdaus, A. Y., Surambo, A., & Pane, H. (2006). *Promised land: Palm oil and land acquisition in Indonesia-implications for local communities and indigenous peoples*. Forest People Programe and Bogor: Perkumpulan Sawit Watch.

Dell'Angelo, J., Rulli, M. C., & D'Odorico, P. (2018). The global water grabbing syndrome. *Ecological Economics, 143*, 276–285.

Direktorat Jenderal Perkebunan. (2018). *Tree crop estate statistics of Indonesia: Palm oil 2017–2019*. Sekretariat Direktorat Jenderal Perkebunan.

GRAIN. (2008, October). *Seized: The 2008 landgrab for food and financial security [pdf]*. Retrieved from https://www.grain.org/e/93-seized-the-2008-landgrab-for-food-and-financial-security

Hadiz, V. R. (2010). *Localising power in post-authoritarian Indonesia: A Southeast Asia perspective*. Stanford University Press.

Kompas. (2017). *Jelang Pilkada Pemberian Izin Meningkat*. (October 4th). Kompas. https://www.kompas.id/baca/nusantara/2017/10/04/jelang-pilkada-pemberian-izin-meningkat

Konsorsium Pembaharuan Agraria (KPA). (2018). *Masa Depan Reforma Agraria Melampaui Tahun Politik: Catatan Akhir Tahun 2018*. Konsorsium Pembaharuan Agraria.

Kusnadi. (2000). *Nelayan: Strategi Adaptasi dan Jaringan Sosial*. Humaniora Utama Press.

Ompusunggu, M. (2018, May 9). In North Sumatra, farmers prefer mangroves to palm oil. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/news/2018/05/08/in-north-sumatra-farmers-prefer-mangroves-to-oil-palm.html

Onirizal. (2015, April 15). Nelayan Berjibaku Selamatkan Mangrove. *Warta konservasi lahan basah, 23*(1), 4–5 & 19. Retrieved from: https://onrizal.files.wordpress.com/2015/09/wklb-23-1-p-4-5-19.pdf

Ostrom, E. (1990). *Governing the commons the evolutions of institutions for collective action*. Cambridge University Press.

Pagiola, S. (2000). *Land use change in Indonesia*. World Bank.

Profil Desa Lubuk Kertang (Lubuk Kertang Profile). (2018). Retrieved from http://lubukkertang.sideka.id/profil/

Putro, W. P., & Nawir, A. A. (2018). *Kelola Hutan di Rezim Semi Sentralisasi: Tinjauan Kritis Dampak UU 23 Tahun 2014 Pada Beberapa Rezim Pengelolan Hutan Berbasis Masyarakat*. Polydoor Printika.

Saragih, D. (2018). *Strategi Perjuangan Kelompok Tani dan Nelayan Lestari Mangrove dalam Memperjuangkan Kelestarian Lingkungan di Desa Lubuk Kertang, Kabupaten Langkat* [Undergraduate thesis, North Sumatera University]. http://repositori.usu.ac.id/handle/123456789/10530

Sari, Z. H. (2012). Studi Tentang Kerusakan Hutan Mangrove di Desa Lubuk Kertang Kecamatan Brandan Barat Kabupaten Langkat. *Jurnal Tunas Geografi, 1*(1), 1–14.

Scott, J. C. (1976). *The moral economy of the peasant rebellion and subsistence in Southeast Asia*. Yale University Press.

Sonjaya, J. A. (2007). *Kebijakan untuk Mangrove: Mengkaji Kasus dan Merumuskan Kebijakan*. International Union for Conservation of Nature and Natural Resources & Mangrove Action Project.

Steni, B. (2016). *Membedah UU pemerintahan daerah yang baru: apa yang baru dalam pembagian urusan dankewenangan pusat-daerah di bidang sumber daya alam?* Institut Penelitian Inovasi Bumi (INOBU).

Syafi'i, I. (2016). Konflik Agraria Di Indonesia: Catatan Reflektif Konflik Perkebunan Sawit Di Kotawaringin Timur. *Journal of Society and Culture, 3*(18), 415–432.

Tadjoeddin, M. Z. (2007, October). *A future resource curse in Indonesia: The political economy of natural resources, conflict and development* (Working paper no 35). Centre for Research on Inequality, Human Security, and Ethnicity.

World Bank. (2008). *Forests sourcebook: Practical guidance for sustaining forests in development cooperation*. https://doi.org/10.1596/978-0-8213-7163-3

Zanden, J. L. V., & Marks, D. (2012). *Ekonomi Indonesia 1800–2010: Antara Drama dan Keajaiban Pertumbuhan*. KITLV and Kompas.

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Chapter 7
Toward Sustainable Lake Ecosystem-Based Management: Lessons Learned from Interdisciplinary Research of Cage Aquaculture Management in Lake Maninjau

Ivana Yuniarti, Clare Barnes, Klaus Glenk, and Alistair McVittie

Abstract Understanding appropriate governance arrangements for managing cage aquaculture systems in tropical lakes is essential, yet it is still overlooked by current studies. Here we discuss the lessons obtained from our interdisciplinary research (environmental–social science, ecology, and ecological economics) evaluating cage aquaculture management scenarios with the aim of facilitating sustainable cage aquaculture management in Lake Maninjau, Indonesia. The lessons we present are based on our analysis of why current management fails to achieve its goals of reduced cage aquaculture and improved water quality in the lake, despite the presence of formal regulations for reaching these goals. The importance of understanding the social, ecological, and economic dimensions in designing management actions is highlighted. We discuss how our research framework embraces methodological and epistemological differences between natural and social scientists to improve research integration and how it supports an adaptive research approach to studying (interventions in) complex ecosystems. We compare the relative advantages of our framework with well-established interdisciplinary conceptual and

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research frameworks revealing that it fulfills pertinent knowledge gaps through detailing the process of discipline integration, embracing epistemological pluralism, and explicitly including the quantification of ecosystem-services trade-offs, uncertainties, and risks in the decision-making process. Finally, we use the lessons from applying our framework to propose a more integrated management action plan in the lake. We expect that the lessons in this research can be widely applied to other cage aquaculture management case studies and contribute to the development of inland water ecosystem management in Indonesia and other Global South Countries.

Keywords Ecosystem management · Interdisciplinary · Socio-ecological · lake · Governance · Aquaculture

7.1 Introduction

The roles of cage aquaculture in supporting livelihoods and alleviating poverty in rural areas are unarguably important (Njiru et al., 2019; Rajee & Mun, 2017; Shava & Gunhidzirai, 2017). They are one of the main reasons for cage aquaculture's massive expansion across lakes in the Global South. However, the operationalization of the cages causes externalities that are suffered by other water users, as the cages are private properties operated in common pool resources (CPR) such as lakes and reservoirs. The externalities (e.g., eutrophication) create conflicts between cage aquaculture and other water users. Entangled problems between cage aquaculture development and degradation of the water bodies are commonly referred to as "wicked problems"—problems that are nondichotomous, hard to define, nested, and complicated (Termeer et al., 2019). To help to solve these problems and to achieve sustainable management of cage aquaculture, research to support the development of suitable governance arrangements is particularly urgent (FAO Fisheries and Aquaculture Department, 2016). However, there are limitations to the current research we wish to address here. First, current literature on open aquaculture management rarely analyzes the institutional setting despite its recognized importance for how cage aquaculture is managed and the impacts it has on livelihoods and the environment (Nadarajah & Flaaten, 2017; Van-Houtte, 2001). Second, both research and management of cage aquaculture mostly follow sectoral lines: disciplines and the epistemological communities gathering around disciplines rarely intersect. This leads to research endorsing particular stakeholder perspectives above others. As will be discussed further below, this affects the **salience and legitimacy** of proposed management actions, ultimately increasing the chance of their failure when implemented at the local (operational) level.

We use the management of cage aquaculture in Lake Maninjau (Fig. 7.1) as our interdisciplinary case study. The management of the lake is representative of the management of many aquatic systems in Indonesia and in the tropical Global South, where sectoral management adopting a single epistemology (or limited epistemologies) is the norm. We use the framework of science–policy interfaces proposed by



Fig. 7.1 Cage aquaculture in Lake Maninjau. (Source: Authors' personal documentation, 2019)

Cash et al. (2003) to frame the presentation of our results. The authors argue that improving the salience, credibility, and legitimacy of research for envisaged stakeholders enhances its use in policy decision-making processes. Salience refers to how relevant the knowledge being produced is to policy stakeholders. Credibility means that the methodologies, evidence, and emerging recommendations are robust and accepted in the policymaking community. Research is legitimate when it has been produced in a manner that respects divergent views and beliefs and is seen as unbiased. Cash et al. (2003) argue that the fulfillment of these criteria helps to align the research with the stakeholders' needs and expectations, increasing the use of the research in the decision-making process. In this chapter, we extend this argument further to posit that these criteria are also relevant for understanding lake management decisions and the knowledges and assumptions such decisions are based upon. In this sense, the stakeholders of such management decisions include the lake users as their perceptions of the salience, credibility, and legitimacy of the management decisions arising from particular epistemologies are essential to their success.

Using these three criteria, we aim to analyze why Lake Maninjau's current management fails to achieve its goal and to provide recommendations and lessons learned for attaining more successful management actions. Furthermore, our central contribution to the academic literature on sustainable ecosystem-based management is a research framework that can be used to embrace the epistemological and methodological differences between (and within) natural and social scientists to better integrate knowledge on sustainable ecosystem-based management.

Cage aquaculture management in Lake Maninjau shows in detail how interweaving socioeconomic and ecological interests on the lake use create so-called wicked problems. The main problem in the lake has been ongoing water quality degradation resulting in mass fish kills and (potentially) declining tourist visits due to the proliferation of cage aquaculture. The cage aquaculture introduced in 1992 has helped to boost the local economy and has created employment opportunities for the locals (Asnil, 2012; Putri et al., 2020). However, due to its uncontrolled growth and unsustainable practices, it has caused severe water quality degradation. The lake also

represents a case of sectoral management adopting a single epistemology approach (in this case, ecology), which has not solved the wicked problems at Lake Maninjau.

Ecologists started advocating for the reduction of cages in 2001, as they thought this would improve water quality (Hartoto & Ridwansyah, 2001). This insight was obtained by calculating the lake's carrying capacity and was formally supported by the issuance of Regency Regulation No. 3/2009 and 5/2014 (Aulia et al., 2019; Nanda et al., 2018). Yet, despite large efforts to reduce the number of cages, their number was still increasing in 2019 when we conducted our fieldwork.

There has been an effort to accommodate multisectoral targets, namely the Save Maninjau Program, which has been greatly promoted since 2017 (Presentation of the Head of Agam Regency, 2017). The program has two main goals (Ministry of Environment and Forestry, Government of Agam Regency, & Government of West Sumatra, 2018): (1) clean/ecologically functioning lake and (2) moving economic activities from being lake based to being land based to reduce cage aquaculture.

To achieve the goals, there are ten main targets of the program (ibid): (1) rehabilitating the catchment area; (2) regulating the hydropower's weir; (3) prohibiting new cages; (4) reducing cages; (5) cleaning surface water; (6) dredging or bioremediation; (7) saving endemic biotas; (8) economic transformation via alternative livelihood provisioning; (9) strengthening regulation; and (10) strengthening institutional support.

However, until recently, only targets 4 and 5 are strongly pursued, as evidenced by abundant reports on cage reduction efforts by local government staff (e.g., Metro Sumbar, 2019; Putra, 2020). Yet, indications of unsustainable management practice are still observed (e.g., exceeding the number of cages formally regulated, social conflicts, eutrophication, and mass fish killed (MFK)). MFK is still being frequently reported at the time of writing (April 2021) (Anwar, 2018; Endah & Nadjib, 2017; Kumparan, 2021). Moreover, alternative livelihood programs and cage reduction actions are not taken up by the cage farmers (Aulia et al., 2019). This impedes the achievement of management targets (ibid) and fuels farmers' resistance.

The failure to prevent MFK events led the Head of Agam Regency to issue a formal letter to ask for support from the Republic of Indonesia President on 6th April 2021 (The Head of Agam Regency, 2021), even though the lake had already been declared a National Priority Lake in 2015–2019 (Aulia et al., 2019), and was therefore already under the responsibility of central government. The letter received a reply from the Head of the Research Centre for Limnology, Indonesian Institute of Sciences, who enclosed a policy brief again endorsing cage reduction and other technical solutions such as creating artificial habitats for native fish (Director of RoL-IIOS, 2021; Pusat penelitian Limnologi LIPI, 2019). From this case, we realized that there had been a mismatch between the needs of local decision-makers and the technical solutions provided by the Research Centre for Limnology, Indonesian Institute of Sciences' reliance on a single epistemological approach, as also reflected by Nanda et al. (2018).

7.2 Methodological Approach

This research is informed stakeholder research informed by approaches in environmental–social science. This epistemology influences and is scrutinized by the other two epistemologies (ecology and ecological economics). The overall process is shown as the route from point A to D in the research framework (Fig. 7.2). The framework itself was generated at the end of our research and is drawn from our collective experiences of the research process, led by the first author.

First, we used the insights obtained from the stakeholders (cage farmers, fishers, hotel owners, regency, and national level government) to scope the analysis and to select suitable methodologies. We also considered data availability and quality in scoping the research. Second, stakeholder insights informed our understanding of the trade-offs between cage aquaculture and other ecosystem services. We use two ecological models (Maximum Entropy Model and Bayesian Belief Networks). This was used to undertake an economic appraisal of several management scenarios, which may help decision-makers to identify priorities for their management actions. We engaged Monte Carlo Simulation (MCS) to conceptualize and analyze the ecological economic data.

To acquire the data, fieldwork was conducted from January to April 2019, followed by the second field sampling in March 2020 to obtain independent data to validate the models used in the research. The fieldwork included interviews, species occurrence sampling, relative abundance of fish, and collection of secondary source data from several governmental institutions. We engaged qualitative research methodology in the environmental–social science section and quantitative research in the ecological and ecological economic modeling section. The qualitative data collection was undertaken through conducting semi-structured interviews and reviewing

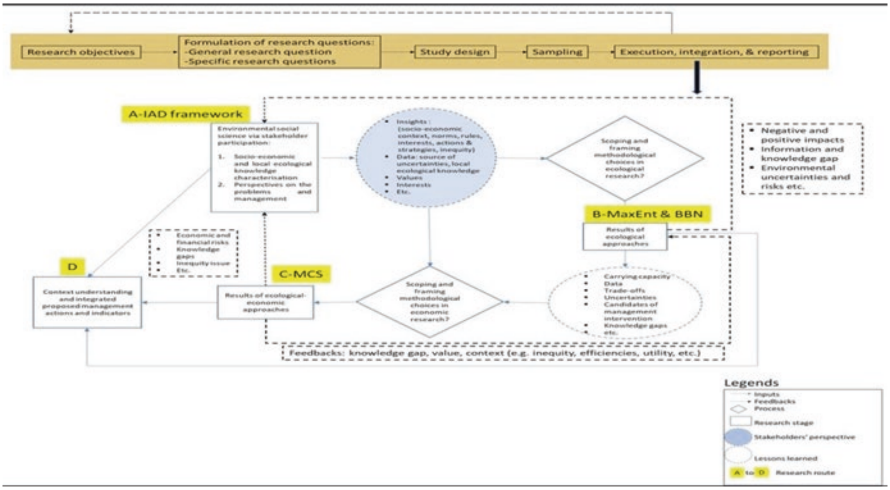


Fig. 7.2 The research framework

relevant policy documents, which generated data subsequently analyzed by employing the Institutional Analysis and Development (IAD) Framework. In the quantitative research sections, we performed the previously mentioned modeling techniques.

7.3 Results and Discussion

7.3.1 Why Does Current Management Fail to Achieve Its Goals?

To answer this question, we analyze the legitimacy and salience of the management actions based on the results obtained from the environmental–social science dimensions and from the ecological–economic dimensions.

7.3.2 The Legitimacy and Salience of Current Management Actions

The environmental–social science part elucidated in Yuniarti et al. (2021a) is summarized in Fig. 7.3. The application of the IAD framework is helpful for discussing targets 9 and 10 in the Save Maninjau targets listed above. Target number nine indicates that the lake managers aim to adopt a strong approach to force people to obey the regulations. The applicability of this approach has been questioned and shown as problematic in Yuniarti et al. (2021a). The application of the IAD framework revealed that a lack of monitoring resources inhibits the success of management actions.

Furthermore, we concluded that there are three main institutional challenges that have to be overcome in order for sustainable cage aquaculture governance to emerge in the study area. The first challenge is the contrasting property-rights definitions used by the people and the lake managers, which creates conditions whereby the common pool resources (CPRs) are managed as an open-access regime. The second obstacle is conflicting formal regulations and customary laws, leading local institutions to be undermined and restraining people from cooperatively supporting the cage reduction program. The third hurdle is inadequate communication and poor levels of trust between the people and the lake managers, which also inhibits cooperation across levels. Overall, these three challenges cause the reduction of the legitimacy of the lake managers and the current management plans at the operational level.

The contrasting definition of property rights has to be eloquently bridged. It can be done by endorsing the role of legitimate local institutions such as *Badan Musyawarah* (BAMUS), which aligns with Save Maninjau target number 10. Unfortunately, efforts to reach this target are still relatively inadequate, as proven by

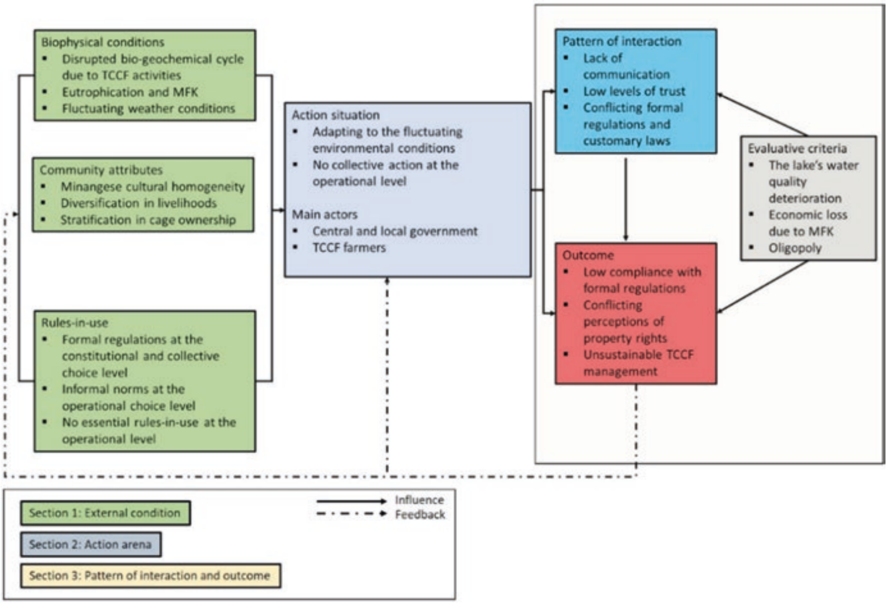


Fig. 7.3 The principal findings of governance of Lake Maninjau organized with the IAD framework. (Source: Yuniarti et al., 2021a)

the limited involvement of social scientists or local stakeholders in the Save Maninjau planning process.

Involving such social science experts is imperative, not merely as facilitators, but also as equal members in the whole management process. Thus, our research leads us to argue that selecting social scientists who have both commitment and capabilities in the managerial team is essential as the process of strengthening institutions requires a reflective approach and a strong understanding of local norms and cultures.

Moreover, substantial bureaucratic changes are required to align the formal regulations with customary laws in the study area, considering that strong religious and cultural norms guide local peoples' practices. Thus, soft approaches involving religious and customary leaders should be used to increase people's participation, rather than using hard law enforcement methods.

The economic dimension provides perspectives for the Save Maninjau program, especially applies to target numbers 3,4,8, 9, and 10. The detailed results of the economic analysis can be found in Yuniarti (2021). From the analysis, we infer that the efforts to reduce cage numbers and improve lake water quality are hampered by a lack of understanding of the economic context in the management planning and of people's economic motives, which influence their behavior. This results in the reduction of the salience of the current management actions proposed by the lake managers.

First, we show how ignoring information on local people's economic behavior from the management planning process (poor legitimacy) can hamper goal attainment by affecting the salience of the lake management approach for farmers. Farmers employ strategies to adapt to the uncertain bio-physical environment. One of the strategies mitigates severe loss in the rainy season when mass fish kills (MFKs) occur (evidenced by the sensitivity analysis, deterministic models, and Monte Carlo Simulation in Yuniarti, 2021). The strategy is observed to be beneficial to securing their livelihood. However, it becomes an impeding factor to governments' efforts to reduce the number of cages on the lake because it justifies that their farming is still profitable. This makes farmers unwilling to leave cage aquaculture, although they have sometimes experienced financial loss due to severe MFK (Fakhrudin et al., 2012; Hamdani et al., 2014; Henny, 2009; Henny & Nomosatryo, 2012, 2016; Henny et al., 2019). Therefore, cage aquaculture is still proliferating even though cage reduction policies have been introduced since 2014. Overall, our evidence reveals that farmers' behavior is (at least partially) driven by economic factors, which need to be considered for achieving the current management target. The significance of understanding local people's behavior and their economic motives to facilitate the success of ecosystem management has been a subject of much research (Black et al., 2013; Freya et al., 2010, 2014; Muhumuza & Balkwill, 2013).

Overall, the economy can be a determining factor for whether local people cooperate in ecosystem management. In the case study, we notice that Payment for Ecosystem Services (PES) may not be an appropriate economic incentive in Lake Maninjau because of the magnitude of private economic benefits from cage culture and concerns about clear attribution of property rights in the lake. Furthermore, as highlighted in Yuniarti et al. (2021a), payments may go to owners who may be city dwellers and thus bypass the local population. Nevertheless, it is clear that being indifferent to local peoples' economic behavior in designing a management plan backfires during its implementation.

Second, we observe from the economic analysis that the annual variable cost is considerably high, which has been a subject of concern for the farmers (see Yuniarti et al., 2021b). We also found that an oligopoly is present and established in the study area. Outsiders or a few wealthy locals fund most cages, and most locals are mere operators. This indicates that there is inequity in the cage aquaculture system. We are concerned that high variable costs, especially feed cost, which makes up more than 90% of the variable cost (Fig. 7.4), will further deepen the inequalities between the poor and the rich in cage funding and profit earning.

Because of the failure of the alternative livelihood project in the Save Maninjau program due to low levels of salience for the farmers, it is likely that the program does not significantly reduce cage aquaculture as intended. The alternative livelihood is mainly aimed at making local people stop practicing cage farming and, consequently, reducing the number of cages. However, most cages are funded by the wealthy and by outsiders. In the field setting, the nonwealthy locals can lease their cages while working as operators. They can also engage in alternative livelihoods.

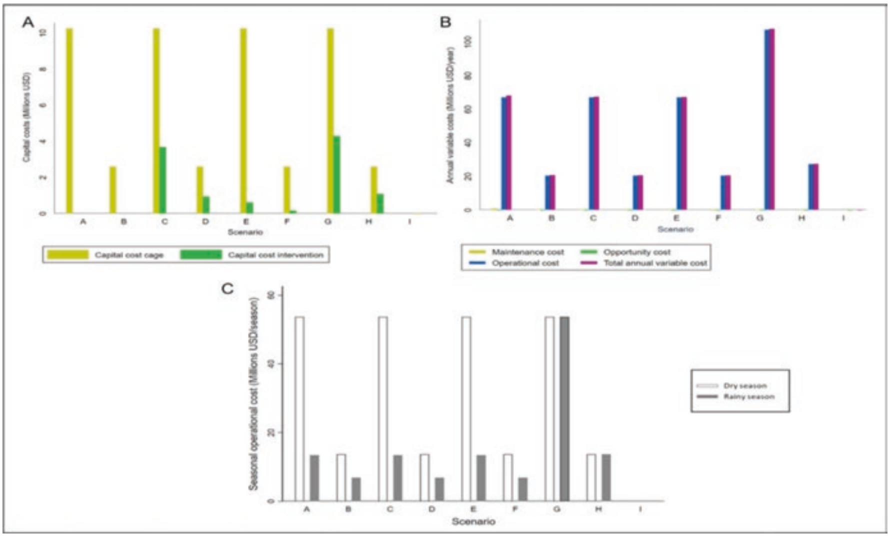


Fig. 7.4 (**a**) Capital costs of cage aquaculture and the proposed management interventions calculated from the deterministic models; (**b**) annual total variable costs (maintenance, operational, and opportunity costs) of cage aquaculture and the proposed management interventions; (**c**) annual operational costs of cage aquaculture. (Source: Yuniarti, 2021)

Thus, in the end, the number of active cages remains high. This circumstance shows that the economic incentive did not work as expected because its planning does not consider the underlying economic and social context.

The failure to design appropriate economic incentives to encourage pro-management behavior has also been well acknowledged by economic and conservation literature. Frey (2001), García-amado et al. (2013), Gneezy et al. (2011), and Rode et al. (2015) revealed that economic incentives could create crowding out effects—undermining intrinsic motives to engage in ecosystem management. However, some studies also recognized crowding in impacts—strengthening the intrinsic motives (Bowles et al., 2012; Janssen & Mendys-kamphorst, 2004; Rode et al., 2015). Learning from these studies, we again underline the pivotal role of understanding the socioeconomic context in designing appropriate management incentives (Frey, 2001; Vollan, 2008).

All in all, it is not enough to understand only the social dynamics or only the economic context. Both aspects are interwoven in people's lives. Therefore, analyses are needed to understand the ways these ***interweaving processes play out*** in a particular context such as the way customary law permitting for owning the area surrounding peoples' houses intertwines with people's motive to maximize profits, hampering their compliance with formal regulations.

7.3.3 *The Credibility of Proposed Management Scenarios*

In this section, we elaborate on the credibility of some proposed technical management scenarios (i.e., business as usual (Scenario A), cage reduction (Scenario B), cage eradication (Scenario I), and technological intervention via aeration and floating wetlands (Scenarios C to H)). We engaged two ecological modeling tools (MaxEnt and BBN) and an economic modeling tool (MCS). We analyzed both local ecological knowledge (LEK) and scientific ecological knowledge (SEK) to understand the externalities generated by the cage aquaculture and use them as valuable inputs in the constructed models (MaxEnt and BBN). Next, we apply MCS to calculate the economic efficiency of the proposed management scenarios. We conclude that using ecological modeling and economic modeling can assist in developing the credibility of the proposed management actions in the scientific communities' and the national and local decision-makers' perspectives.

In one of the ecological models, elucidated in Yuniarti et al. (2021b, in progress), we analyze a positive externality of the cage's operation. The analyzed externality is related to habitat services provisioning (food source and shelters) to a native fish species, *Gobiopterus* sp. This means that cage aquaculture in Lake Maninjau involves a trade-off, where its negative effect is represented by exacerbated up-welling that results in more frequent MFK and temporary forgone production of *Gobiopterus* sp. following the up-welling event (see Yuniarti et al., 2021c).

Using the results obtained from the BBNs (Fig. 7.5), we underline that controlling internal phosphorus (P) release is equally as important as reducing the external load. Therefore, we realized that the overarching management target should be a reduction of external and internal P load, not only cage reduction.

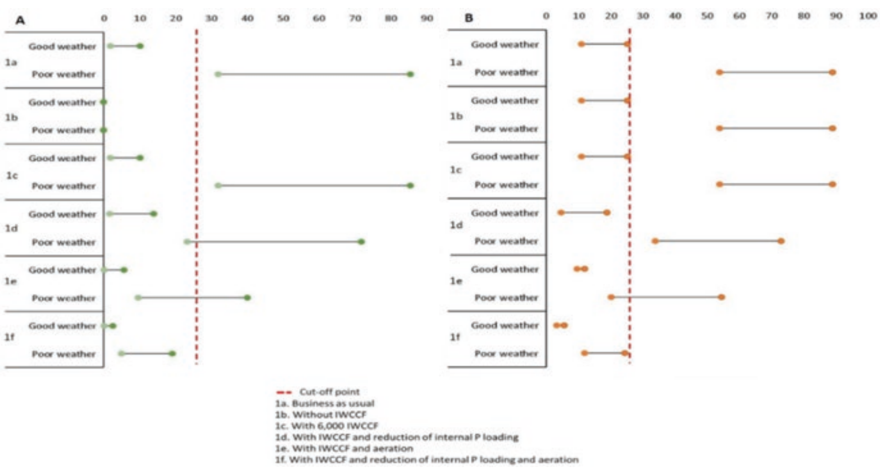


Fig. 7.5 Predicted probability of several short-term management scenarios representing current conditions. (**a**) MFK, (**b**) *Gobiopterus* disappearance. (Source: Yuniarti et al., 2021c)

We revealed that appropriate management in terms of a resource monitoring program is required to avoid ecological traps of habitat provision by the cages. An ecological trap describes a phenomenon when artificial habitat introduction leads to negative consequences for the fish such as overfishing in other regions (Nobile et al., 2018; Swearer et al., 2021). Furthermore, we emphasized the significance of understanding ecological carrying capacity to support cage aquaculture and how to increase this carrying capacity with several technological interventions.

Furthermore, other mitigating efforts such as aeration and floating wetlands can be seen as alternative actions (Fig. 7.6). We received criticism from our ecologist colleagues when we proposed the idea that these technologies can be short-term solutions, which indicates that cage reduction is still the main (or sole) target for most ecologists. This situation shows that professional norms and "normal" ways of doing things (i.e., informal institutions) are very important as practitioners and researchers are involved in making decisions about lake management, not only to understand the communities/research users (Giller et al., 2008; Mosse, 2014). Similar arguments are made by Fleischman et al. (2014) who analyzed how professional norms drive the continuation of specific management interventions (e.g., tree planting), which are widely adopted despite overwhelming evidence that they do not support the achievement of the project goals (e.g., reduced deforestation).

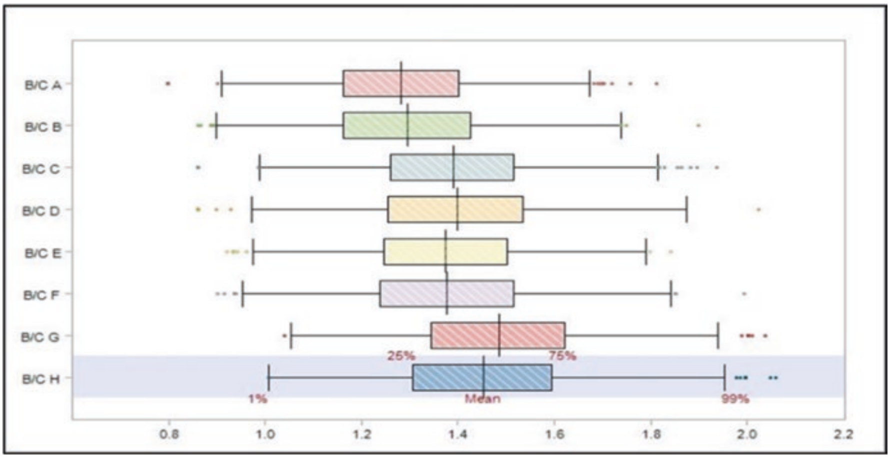


Fig. 7.6 Benefit–cost ratio (B/C) of the proposed management scenarios resulted from Monte Carlo simulation. (Source: Yuniarti, 2021)

7.3.4 *Integrated Perspective of Socio–ecological–Economic Research and Proposed Recommendations to Improve Lake Maninjau Management*

After reflecting on the importance of understanding the social and economic context of the case study for designing management plans, we question whether cage reduction is a feasible and effective management target. Although the limnologists have emphasized that it will be the main target, we would rather suggest that cage reduction should be considered as one of the various alternative management actions. The economic analysis shows that cage reduction alone will significantly diminish the lake's economic value (see Yuniarti, 2021). More importantly, enforcing cage reduction alone or cage eradication without addressing the inequality and other socioeconomic issues will trigger adverse social impacts such as deepened social conflicts due to the marginalization of local people from the resources, as shown by many fortress-conservation practices (Baynham-herd et al., 2018; Büscher, 2016; Czech, 2008; Vedeld et al., 2012). Fortress conservation is a conservation practice that creates an isolated protected area by excluding people from the natural resources (Doolittle, 2007).

More importantly, we underline the significance of shifting the management goal from a clean, ecologically functioning lake to a sustainable lake. This broad management goal will give an umbrella to a wider perspective as sustainability can be defined from environmental, economic, and social perspectives (Degnbol et al., 2006).

As a consequence, new success indicators must be agreed upon among different scientists and stakeholders because sustainability can be perceived differently from social, environmental, and economic perspectives or even within each of these perspectives. Therefore, we suggest the formation of a management board comprised of social–ecological–economic scientists, decision-makers, and other involved stakeholders to discuss potential indicators. Furthermore, we advise that the board discussion should be facilitated by experienced facilitators to avoid epistemological sovereignty: domination of one epistemic while reducing others to mere support roles (Miller et al., 2008; Robinson et al., 2019). This would further increase the salience and legitimacy of the management plans.

Changing indicators would point to a need for new management action plans. For example, agreeing on maximizing the economic value of water quality improvement includes both economic and ecological aspects. It creates new insights for the action plans such as reduction of P loading by endorsing the application of integrated multitrophic aquaculture (IMTA). This technology is proven to not only reduce P loading but also increase economic benefits (Chopin et al., 2004; Hishamunda et al., 2014; Mungkung et al., 2013; Said et al., 2020). Other alternative actions to control P loading such as internal P-control (i.e., sediment capping) are also endorsed. Furthermore, if the agreed indicators are reduced P loading and maintaining the current level of local peoples' well-being, cage reduction will be

only one of the various alternative actions. Consequently, if it is a chosen action, then it should be accompanied by actions to address the inequity and poverty issues.

Next, imposing cage reduction by enforcing formal policy failed as a viable strategy. The new paradigm of management planning should shift to improving peoples' cooperation rather than emphasizing peoples' compliance with formal management regulations. To achieve this cooperation, we have suggested that economic incentives can help with generating a positive attitude toward management to a certain extent, although there is evidence that economic incentives can also have opposite effects. In this case, combining economic incentives with strengthening social norms and moral obligations can provide a solution, as suggested by Berkes et al. (2000) and Ostrom et al. (1994).

Moreover, we suggest channeling the planned management incentives through a trustworthy authority to improve people's cooperation. One option could be the Fisheries Agency mediated by local leaders that our research reveals are trusted by the locals (Yuniarti et al., 2021a). Another option is forming an independent lake management commission such as exhibited in The Great Lakes, USA, and Lake Biwa, Japan (Gaden et al., 2021; Nakatsuka et al., 2020).

Learning from ecological and ecological economics research, we suggest that future management of Lake Maninjau should incorporate uncertainties (data, human, environmental) and ecosystem capacity in the management planning and implementation. This can be done by employing modeling tools, which can help design user-friendly and credible decision-support systems (DSS). Tools that can overcome an old and common problem, data limitation, and can facilitate participatory decision-making, such as BBN, are particularly endorsed. Tools that can take into account local people's perspectives to form recommendations can increase trust, salience, and legitimacy of the results (Ruckelshaus et al., 2015; van Voorn et al., 2016).

As a consequence, researchers whose work relates to Lake Maninjau management should transform their research paradigm from business-as-usual project-oriented research to supporting the development of flexible, inclusive, and adaptive DSS by incorporating various disciplinary perspectives (salience) as reflected by Jacobson et al. (2009). Related to this, future research in the study area is advised to focus on the application of technological interventions related to lake restoration and its impacts.

Overall, we conclude that to embrace the diverse perspectives for improving management of Lake Maninjau, significant work on managerial and research levels is required. This includes shifting management goals, agreeing on integrated management action plans (increasing salience and legitimacy), conceptualizing integrated success indicators (increasing legitimacy), and possibly forming a special commission (increasing credibility, salience, and legitimacy). Similar suggestions arise from reflections on long-term interdisciplinary research in fisheries management by Degnbol et al. (2006). They found that improvement of the management can only be achieved by accepting and responding to the complexity of the management problem rather than the promotion of technical fixes. In other words, the

management needs to be more adaptive and acknowledge system uncertainties and complexities. In short, we adopt the popular jargon that "complex problems require complex solutions and explanations" (Lara, 2015, p. 573).

7.3.5 *The Role of the Research Framework in Conducting an Interdisciplinary Study*

In this section, we discuss how the research framework helps embrace methodological and knowledge discrepancies between natural and social scientists. In this study, we use the research framework (Fig. 7.2) by adopting one epistemology (environmental–social science epistemology by employing stakeholder-informed research), which then is influenced (supported and criticized) by other epistemologies (ecology and ecological economics). We used the framework by following the route from point A to D and focused the discussion of the framework on how stakeholders' insights obtained through environmental–social science research influence and are scrutinized by the other two disciplines. However, it would be possible to follow the framework using a different path (e.g., starting from ecology). This flexibility makes its application consistent with Ostrom's suggestion to not excessively use a single theory of a discipline to understand and solve complex social problems (Lara 2015). In other words, the framework is mainly aimed at avoiding epistemological sovereignty—other disciplines are merely acting as support for one discipline—or epistemological silos—preserving an individual's epistemology, while finding validation from other disciplines (Healy, 2003; Miller et al., 2008).

The research framework encompasses interdisciplinary research principles, which may bridge methodological and knowledge differences between ecologists and social scientists by providing room for an iterative approach (Fig. 7.2). First, it uses stakeholders' perspectives to shape methodological choices. The stakeholders involved in this research were cage farmers, fishers, hotel owners, and sub-regency, regency, and central government. Second, it gives room for feedback from one discipline to another and back to stakeholders representing an iterative approach of learning. Iterative methods, an important aspect in conducting interdisciplinary research (Steffen, 2009), can be used to evaluate gaps that need to be jointly addressed.

Figure 7.2 illustrates how incorporating environmental-science research is useful to shape the choices of methodologies. It is revealed in the figure that it contributes by giving inputs (stakeholders' insights, data, values, interests, etc.), which are useful in various ways to scope and frame methodological choices to incorporate the obtained inputs. First, the research produces stakeholders' insights including on their economic behaviors, working rules that shape their behaviors, and wider socioeconomic context such as inequality. These insights provide context as to what they value, their actions, and their interests, which further enhances the understanding of the system context among the researchers. The understanding of context is

useful for us, the researchers, to frame the research methodology by providing scope and focus for the study. Furthermore, it directs us to choose appropriate methodologies.

As an example, the choice to use MaxEnt and BBN is fostered by the aim to accommodate fishers' insightful knowledge that cage aquaculture provides a habitat and causes temporary forgone production for the native fish. We believe that without their insights, we would have proceeded in a different direction such as cage aquaculture disrupting fish native habitat as hinted at by many scholars (Alcanices et al., 2001; Zhou et al., 2011). Furthermore, we use the context of the two fish species (*Gobiopterus* sp. and *Rasbora maninjau*) to give an insight that aquaculture can provide not only negative but also positive impacts on native fish. We would not have reached this conclusion without obtaining stakeholders' insights through environmental–social science methods and employing an inductive approach using the context provided by the stakeholders, validated by the ecological model. This inductive method is contrasted with most hypothetical-deductive approaches arguing that the impact of fish introduction via aquaculture is merely negative and depends on the ecology of the introduced species. Overall, it shows that embracing another epistemology can influence the conventional methodological approach in one already established discipline.

Another example is related to the information from the hotel owners about the negative impact of new tourism spots on the number of tourist visits to the lake. Without having this discussion with them, we would have assumed that the decline was merely caused by water quality deterioration. Then, we might have ended up engaging simple linear regression to calculate the economic value of trade-offs of water quality and tourism as undertaken by a previous study in the study area (see Everina et al., 2017). By obtaining this information, the relevance of an alternative methodology can be seen, such as mixed-effects models or other models if quality data can be obtained in the future. This insight supports calls for working with local ecological knowledge (LEK) to shape methodological choices. LEK is defined as knowledge related to ecological interaction obtained from local people's experience while interacting with the environment (Joa et al., 2018). This lesson aligns with the finding of the research conducted by Berkström et al. (2019), Cebrián-Piqueras et al. (2020), and Ruddle and Davis (2013), who found that LEK is frequently coherent and complementary to scientific ecological knowledge, further justifying the usefulness of LEK to inform decision-making processes.

Furthermore, stakeholders' perspectives also provide data and information for this research, for example, by providing information on sources of uncertainties. It is important to address the uncertainties, as mentioned in the previous chapters. Knowledge on the occurrence of uncertainties affects the methodological choices in sequential ecological and economic research (cf. Refsgaard et al., 2007), who concluded that suitable approaches are needed to address data and human uncertainties. In this research, we chose to use BBN and MCS due to their ability to include uncertainty.

Apart from providing room for the stakeholders' perspective to give input, the research framework also gives space for iterative learning by incorporating feedback from each step to inform other preceding stages. The accommodation of iterative processes in the research ultimately assists in adopting epistemological and methodological differences between natural and social scientists. One example taken from this case study is how input from social environmental science and feedback from ecological economic science helps ecological research become more relevant to human systems. Furthermore, iterative processes aid in building more adaptive research in the uncertain lake ecosystem to generate more comprehensive management recommendations.

The iterative process consists of two parts: framing and reframing processes (Oughton & Bracken, 2009). In this case study, one example of a framing process is shown by the role of stakeholders' inputs in scoping and driving the methodological choices of the economics research. Meanwhile, an example of a reframing process is taking the feedback from studying the economic context (efficiency, equity, etc.) to evaluate the feasibility of recommendations from ecological research.

This reframing process may trigger an initiative for the ecologists to re-evaluate and reconsider other alternative scenarios (referred to as a **knock-on effect**). An example of this is shifting our perspective from cage reduction as a main management target to one of the alternative actions (e.g., sediment capping and IMTA).

By allowing framing and reframing processes to happen, ecological research is directed to align better with human systems (as expected by Dietze et al., 2018; Endter-Wada et al., 1998). Thus, in this case, ecology has shifted from a discipline merely used to understand natural systems and how humans influence them, as previously observed by Bastow et al. (2000) and Lowe et al. (2009). It gives ecology a new direction as a science to depict human influence on systems to support sustainable decision-making (Williams & Hooten, 2016).

Another example of an iterative process is provided by the feedback from economists and ecologists to environmental social scientists about the presence of knowledge gaps such as how the selected management scenario may affect residents' livelihoods and their well-being. This feedback can be used by the environmental social scientists to analyze why certain scenarios are adapted more (or in a different way) than others. Therefore, it can provide a new research question for the team to address in the future.

In short, from the examples, we conclude that iterative approaches facilitated by the framework can break disciplinary isolation and help bridge epistemological and methodological differences between natural and social scientists. More importantly, the framework adopts flexibility, learning, and integrated problem-solving principles, providing a more explicit connection of the research to the decision-making support system (DSS) and adaptive management, as argued by Arnold et al. (2017).

7.3.6 The Connection Between the Framework and Previously Developed Interdisciplinary Frameworks

Our framework shares commonalities with existing interdisciplinary frameworks, but it is also distinctly different in certain aspects. The connection between our framework and the well-known drivers–pressures–states–impacts–responses (DPSIR) framework is observed because our research framework in Fig. 7.2 describes the operational methodology to quantify risks and uncertainties of human activities on the natural system and vice versa. DPSIR is a conceptual framework describing the connections between human and natural systems (Baldwin et al., 2016; Kristensen, 2004; Lewison et al., 2016). Although DPSIR has been widely used to generate conceptual models, its application lacks quantification of the reciprocal relationships between human and natural systems (trade-offs) (Patrício et al., 2016). In this case, our research framework extends the application of DPSIR by endorsing the quantification of trade-offs, uncertainties, and risks shown in our case study, as reflected by Patrício et al. (2016) and Smith et al. (2016) and by relating the DPSIR application to DSS as proposed by Dolbeth et al. (2016).

Likewise, the framework connects to the epistemological pluralism framework proposed by Miller et al. (2008). Our research framework is an actual example of their framework's third stage (co-production of research framework). Specifically, our research framework aligns with the epistemological pluralism concept in their framework. One main similarity between our research framework and theirs is that both embrace different epistemologies among the researchers to produce an iterative learning process. Furthermore, both frameworks acknowledge negotiating knowledge and values between researchers (i.e., the knock-on effect in this case study).

In relation to previously proposed interdisciplinary research frameworks, we associate this framework with the MIR (Methodology in Interdisciplinary Research) framework proposed by Tobi & Kampen (2018). The MIR framework was selected because it started with a solid foundation of conducting good research design, and it was formulated in an educational environment where the students as the respondents of the frameworks were firstly reluctant and had prejudice to other disciplines. This condition is similar to the research condition in the study area. Moreover, the MIR framework is increasingly used in teaching multidisciplinary and interdisciplinary students (Tobi & Kampen, 2018; Vuye et al., 2016).

The brown part of our framework (Fig. 7.2) is a general approach used by MIR framework. Our research framework describes details and focuses on the execution and integration part of the MIR framework. The MIR framework itself did not provide details on how the integration should be conducted, for example, what information should be taken from each discipline (Tobi & Kampen 2018). Therefore, this framework acts as an extension of the MIR framework in terms of details on the integration process.

Furthermore, we highlight that the framework aligns with the iterative research framework proposed by Grace et al. (2021), which underlines that methods should

evolve during the research process and not be determined at the beginning of the study. Both frameworks also emphasize the development of adaptive research by generating an iterative process. Again, our research framework delivers details on how the iteration is done, which was not elucidated by the iterative frameworks. Moreover, it elaborates on what aspects should be focused on in each learning step to overcoming differences between the disciplines being compared.

In sum, our framework complements previous interdisciplinary research frameworks by providing details on operational aspects of the integration and iterative part of the research. More importantly, it also explicitly describes the inclusion of uncertainties and risks and how all these aspects are connected to the DSS.

Overall, most interdisciplinary frameworks describe the connection of the components of the systems, but seldom do they elucidate how to operationalize research to overcome the challenges of integration (Brandt et al., 2013; MacLeod, 2018). Our research framework fills this gap by elaborating the details on how to bridge methodological and epistemological differences between natural and social scientists. Furthermore, it also acts as an operational guideline to operationalize several interdisciplinary conceptual frameworks.

7.4 Conclusion

Our interdisciplinary approach enables an analysis of the causes of low salience and legitimacy of current management actions, which lead to failure in the implementation of the plans at the operational level. The approach is also useful for demonstrating the credibility of several proposed management scenarios. We suggest that the lake managers in the area should consider facilitating the formation of a locally legitimate agency as a channel to accommodate various perspectives and to increase the likelihood that the management plans are salient and legitimate.

Furthermore, our research framework helps operationalize previously developed conceptual frameworks for interdisciplinary research and encourages researchers and resource managers to embrace epistemological and methodological differences between natural and social sciences. We expect that this research can be a solid and useful foundation to develop a more integrated ecosystem management in the study area and for other lakes in Indonesia.

References

Alcanices, M. M., Pagulayan, R. C., & Mamaril, A. C. (2001). Impact assessment of cage culture in Lake Taal, Philippines. Conservation and Ecological Management of Philippine Lakes in Relation to Fisheries and Aquaculture. *Proceedings of the National Seminar-Workshop*, (2001), 1–153. Retrieved from http://search.proquest.com/docview/1367494195?accountid=28676 http://sfxeu11.hosted.exlibrisgroup.com/sfxslub?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:book&genre=conference&sid=ProQ:Aquatic+Science+&+Fisheries+Abstracts+(ASFA)+Aquaculture+Abst

Anwar, L. A. (2018). *Analisis kelembagaan dalam pengelolaan keramba jaring apung (KJA) Danau Maninjau Sumatera Barat*. Institut Pertanian Bogor.

Arnold, C. A. T., Gosnell, H., Benson, M. H., & Craig, R. K. (2017). Cross-interdisciplinary insights into adaptive governance and resilience. *Ecology and Society, 22*(4). https://doi.org/10.5751/ES-09734-220414

Asnil. (2012). *Analisis penilaian ekonomi dan pemanfaatan sumberdaya danau yang berkelanjutan* (Studi kasus Danau Maninjau Sumatera Barat). Unpublished thesis. Institut Pertanian Bogor.

Aulia, S., Ariany, R., & Koeswara, H. (2019). Implement the save Maninjau policy on Lake Maninjau. *The International Conference on ASEAN, 2019*, 166–170. https://doi.org/10.1515/9783110678666-022

Baldwin, C., Lewison, R. L., Lieske, S. N., Beger, M., Hines, E., Dearden, P., et al. (2016). Using the DPSIR framework for transdisciplinary training and knowledge elicitation in the Gulf of Thailand. *Ocean and Coastal Management, 134*, 163–172. https://doi.org/10.1016/j.ocecoaman.2016.09.005

Bastow, S., Dunleavy, P., Goldchluk, S., Hancock, A., Harries, E., & Mann, R. (2000). *The impact of the social sciences how academics and their research make a difference* (London, Ed.). SAGE.

Baynham-herd, Z., Redpath, S., Bunnefeld, N., Molony, T., & Keane, A. (2018). Conservation conflicts : Behavioural threats, frames, and intervention recommendations. *Biological Conservation, 222*(April), 180–188. https://doi.org/10.1016/j.biocon.2018.04.012

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications, 10*(October), 1251–1262.

Berkström, C., Papadopoulos, M., Jiddawi, N. S., & Nordlund, L. M. (2019). Fishers' local ecological knowledge (LEK) on connectivity and seascape management. *Frontiers in Marine Science, 6*(MAR), 1–10. https://doi.org/10.3389/fmars.2019.00130

Black, S. A., Groombridge, J. J., & Jones, C. G. (2013). Using better management thinking to improve conservation effectiveness. *ISRN Biodiversity, 2013*, 1–8. https://doi.org/10.1155/2013/784701

Bowles, S., Polanía-reyes, S., Bowles, S., & Polania-reyes, S. (2012). Economic incentives and social preferences : Substitutes or complements? *Journal of Economic Literature, 50*(2), 368–425.

Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D. J., Newig, J., et al. (2013). A review of transdisciplinary research in sustainability science. *Ecological Economics, 92*, 1–15. https://doi.org/10.1016/j.ecolecon.2013.04.008

Büscher, B. (2016). Reassessing fortress conservation? New media and the politics of distinction in Kruger national park. *Annals of the American Association of Geographers, 106*(1), 114–129. https://doi.org/10.1080/00045608.2015.1095061

Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H., … Mitchell, R. B. (2003). Knowledge systems for sustainable development. In *Proceedings of the National Academy of Sciences* (pp. 8086–8091).

Cebrián-Piqueras, M. A., Filyushkina, A., Johnson, D. N., Lo, V. B., López-Rodríguez, M. D., March, H., et al. (2020). Scientific and local ecological knowledge, shaping perceptions towards protected areas and related ecosystem services. *Landscape Ecology, 35*(11), 2549–2567. https://doi.org/10.1007/s10980-020-01107-4

Chopin, T., Robinson, S., Sawhney, M., Bastarache, S., Belyea, E., Shea, R., et al. (2004). The AquaNet integrated multi-trophic aquaculture pro ject: Ra tio nale of the project and development of kelp Culti vation as the Inor ganic extractive com po nent of the system. *Bulletin of the Aquaculture Association of Canada, 104*(January), 11–18.

Czech, B. (2008). Prospects for reconciling the conflict between economic growth and biodiversity conservation. *Conservation Biology, 22*(6), 1389–1398. https://doi.org/10.1111/j.1523-1739.2008.01089.x

Degnbol, P., Gislason, H., Hanna, S., Jentoft, S., Raakjær Nielsen, J., Sverdrup-Jensen, S., & Clyde Wilson, D. (2006). Painting the floor with a hammer: Technical fixes in fisheries management. *Marine Policy, 30*(5), 534–543. https://doi.org/10.1016/j.marpol.2005.07.002

Dietze, M. C., Fox, A., Beck-Johnson, L. M., Betancourt, J. L., Hooten, M. B., Jarnevich, C. S., et al. (2018). Iterative near-term ecological forecasting: Needs, opportunities, and challenges. *Proceedings of the National Academy of Sciences of the United States of America, 115*(7), 1424–1432. https://doi.org/10.1073/pnas.1710231115

Director of RoL-IIOS. (2021). Tanggapan disposisi Kepala LIPI terkait surat Bupati Agam. .

Dolbeth, M., Stålnacke, P., Alves, F. L., Sousa, L. P., Gooch, G. D., Khokhlov, V., et al. (2016). An integrated Pan-European perspective on coastal Lagoons management through a mosaic-DPSIR approach. *Scientific Reports, 6*(March 2015), 1–12. https://doi.org/10.1038/srep19400

Doolittle, A. A. (2007). Fortress conservation. In P. Robbins (Ed.), *Encyclopedia of environment and society* (p. 705). SAGE.

Endah, N. H., & Nadjib, M. (2017). Pemanfaatan dan Peran Komunitas Lokal dalam Pelestarian Danau Maninjau. *Jurnal Ekonomi Dan Pembangunan, 25*(1), 55–67.

Endter-Wada, J., Blahna, D., Krannich, R., & Brunson, M. (1998). A framework for understanding social science contributions to ecosystem management. *Ecological Applications, 8*(3), 891–904. https://doi.org/10.1890/1051-0761(1998)008[0891:AFFUSS]2.0.CO;2

Everina, S., Bathara, L., & AN, D. (2017). *Pengaruh perkembangan usaha keramba jaring Apung terhadap pariwisata di Danau Maninjau, Kecamatan Tanjung Raya, Kabupaten Agam, Provinsi Sumatera Barat (Influence of floating cage culture on Lake Maninjau tourism).* Unpublished thesis. University of Riau, Indonesia.

Fakhrudin, M., Satya, I. A., Tjandra C, A. H., A.S, F., T, E., & Kodarsyah. (2012). Pengembangan sistem monitoring online dan peringatan dini bencana lingkungan (Studi Kasus di Danau Maninjau) (Development of online monitoring and early warning system: Acasestudy in Lake Maninjau). In *Proceeding of National Conference on Limnology* (pp. 49–64). Pusat Penelitian Limnologi LIPI.

FAO Fisheries and Aquaculture Department. Governance of Aquaculture. (2016). Retrieved from http://www.fao.org/fishery/governance/aquaculture/en

Fleischman, F. D., Loken, B., Garcia-Lopez, G. A., & Villamayor-tomas, S. (2014). Evaluating the utility of common-pool resource theory for understanding forest governance and outcomes in Indonesia between 1965 and 2012. *International Journal of the Commons, 8*(2), 304–336.

Frey, B. S. (2001). Motivation crowding theory. *Journal of Economic Survey, 15*(5).

Freya, A., John, S., Edwards-Jones, G., & Jones, J. P. G. (2010). Conservation and human behaviour: Lessons from social psychology. *Wildlife Research, 37*, 658–667. https://doi.org/10.1071/WR10032

Freya, A., John, S., Keane, A. M., Jones, J. P. G., & Milner-Gulland, E. J. (2014). Robust study design is as important on the social as it is on the ecological side of applied ecological research. *Journal of Applied Ecology, 51*(6), 1479–1485. https://doi.org/10.1111/1365-2664.12352

Gaden, M., Brant, O. C., & Lambe, R. (2021). Why a Great Lakes Fishery Commission? The seven-decade pursuit of a Canada-U.S. fishery treaty. *Journal of Great Lakes Research*, (xxxx). https://doi.org/10.1016/j.jglr.2021.01.003

García-amado, L. R., Ruiz, M., & Barrasa, S. (2013). Motivation for conservation : Assessing integrated conservation and development projects and payments for environmental services in La Sepultura Biosphere Reserve, Chiapas, Mexico. *Ecological Economics, 89*, 92–100. https://doi.org/10.1016/j.ecolecon.2013.02.002

Giller, K. E., Leeuwis, C., Andersson, J. A., Andriesse, W., Brouwer, A., Frost, P., et al. (2008). Competing claims on natural resources: What role for science? *Ecology and Society, 13*(2). https://doi.org/10.5751/ES-02595-130234

Gneezy, U., Meier, S., & Rey-Biel, P. (2011). When and why incentives (don't) work to modify behavior. *Journal of Economic Perspectives, 25*(4), 191–210.

Grace, K., Siddiqui, S., & Zaitchik, B. F. (2021). A framework for interdisciplinary research in food systems. *Nature Food, 2*(1), 1–3. https://doi.org/10.1038/s43016-020-00212-6

Hamdani, A., Tanjung, L. R., & Sutrisno (2014). Uji efektivitas kantung penampung limbah karamba jaring apung (KJA) berbahan nilon terhadap limbah budidaya ikan nila (Oreochromis niloticus) di Danau Maninjau. In *Proceeding of National Conference on Limnology VII* (pp. 337–345).

Hartoto, D. I., & Ridwansyah, I. (2001). *Penghitungan daya dukung danau atau waduk untuk pengembangan budiday a ikan dalam karamba (contoh kasus Danau Maninjau)*. .

Healy, S. (2003). Epistemological pluralism and the "politics of choice". *Futures, 35*(7), 689–701. https://doi.org/10.1016/S0016-3287(03)00022-3

Henny, C. (2009). Dynamics of biogeochemistry of sulfur in Lake Maninjau. *LIMNOTEK, XVI*(2), 74–87.

Henny, C., & Nomosatryo, S. (2012). Dinamika Sulfida di Danau maninjau: implikasi terhadap pelepasan fosfat di lapisan hipolimnion. In *Proceeding of Seminar National Limnologi VI* (pp. 91–106). Pusat Penelitian Limnologi LIPI.

Henny, C., & Nomosatryo, S. (2016). Changes in water quality and trophic status associated with cage aquaculture in Lake Maninjau, Indonesia. In *IOP Conf. Series: Earth and Environmental Science* (Vol. 31, pp. 1–9). https://doi.org/10.1088/1755-1315/31/1/012027

Henny, C., Sulastri, Yoga, G. P., Susanti, E., Aji, G. S., Jasalemana, T., … Nasfisah, E. (2019). *Teknologi Penyehatan Danau untuk Mendukung Budidaya Teknologi Penyehatan Danau untuk Mendukung Budidaya Perikanan dan Pariwisata Pusat Penelitian Limnologi Lembaga Ilmu Pengetahuan Indonesia (LIPI)*. Cibinong, Indonesia.

Hishamunda, N., Ridler, N., & Martone, E. (2014). *Policy and governance in aquaculture Lessons learned and way forward*. FAO Fisheries and Aquaculture Technical Paper 577. Retrieved from http://www.fao.org/3/a-i3156e.pdf

Jacobson, C., Hughey, K. F. D., Allen, W. J., Rixecker, S., & Carter, R. W. (2009). Toward more reflexive use of adaptive management. *Society and Natural Resources, 22*(5), 484–495. https://doi.org/10.1080/08941920902762321

Janssen, M. C. W., & Mendys-kamphorst, E. (2004). *The price of a price : on the crowding out and in of social norms, 55*, 377–395. https://doi.org/10.1016/j.jebo.2002.11.004

Joa, B., Winkel, G., & Primmer, E. (2018). The unknown known – A review of local ecological knowledge in relation to forest biodiversity conservation. *Land Use Policy, 79*, 520–530. https://doi.org/10.1016/j.landusepol.2018.09.001

Kristensen, P. (2004). The DPSIR framework. In *A comprehensive / detailed assessment of the vulnerability of water resources to environmental change in Africa using river basin approach using river basin approach* (pp. 1–10). Retrieved from http://enviro.lclark.edu:8002/rid=1145949501662_742777852_522/DPSIROverview.pdf

Kumparan. (2021, April 30). Foto: Bangkai Ribuan Ikan yang Mati di Danau Maninjau, Sumatera Barat. *Kumparan News*. Retrieved from https://kumparan.com/kumparannews/foto-bangkai-ribuan-ikan-yang-mati-di-danau-maninjau-sumatera-barat-1veScEpB4OQ/full?utm_source=kumApp&utm_campaign=share&shareID=KbxfFNa2dpQq

Lara, A. (2015). Rationality and complexity in the work of Elinor Ostrom. *International Journal of the Commons, 9*(2), 573–594. https://doi.org/10.18352/ijc.468

Lewison, R. L., Rudd, M. A., Al-hayek, W., Baldwin, C., Beger, M., Lieske, S. N., et al. (2016). How the DPSIR framework can be used for structuring problems and facilitating empirical research in coastal systems. *Environmental Science & Policy, 56*, 110–119.

Lowe, P., Whitman, G., & Phillipson, J. (2009). Ecology and the social sciences. *Journal of Applied Ecology, 46*, 297–305. https://doi.org/10.1111/j.1365-2664.2009.01621.x

MacLeod, M. (2018). What makes interdisciplinarity difficult? Some consequences of domain specificity in interdisciplinary practice. *Synthese, 195*(2), 697–720. https://doi.org/10.1007/s11229-016-1236-4

Metro Sumbar. (2019, September 6). *Program Save Maninjau, Keramba Milik Investor Luar Ditertibkan*. Metro Sumbar.

Miller, T. R., Baird, T. D., Littlefield, C. M., Kofinas, G., Chapin, F. S., & Redman, C. L. (2008). Epistemological pluralism: Reorganizing interdisciplinary research. *Ecology and Society, 13*(2). https://doi.org/10.5751/ES-02671-130246

Ministry of Environment and Forestry, Government of Agam Regency, & Government of West Sumatra. (2018). *Rencana Pengelolaan Danau Maninjau Tahun 2019–2203*. Padang.

Muhumuza, M., & Balkwill, K. (2013). Factors affecting the success of conserving biodiversity in national parks: A review of case studies from Africa. *International Journal of Biodiversity, 2013*, 1–20. https://doi.org/10.1155/2013/798101

Mungkung, R., Aubin, J., Prihadi, T. H., Slembrouck, J., Van Der Werf, H. M. G., & Legendre, M. (2013). Life cycle assessment for environmentally sustainable aquaculture management: A case study of combined aquaculture systems for carp and tilapia. *Journal of Cleaner Production, 57*, 249–256. https://doi.org/10.1016/j.jclepro.2013.05.029

Nadarajah, S., & Flaaten, O. (2017). Global aquaculture growth and institutional quality. *Marine Policy, 84*, 142–151. https://doi.org/10.1016/j.marpol.2017.07.018

Nakatsuka, N., Kosaka, S., Taki, K., Nakamura, M., & Nakagawa, H. (2020). Better governance for integrated management of the Lake Biwa—Yodo River Basin. *Lakes and Reservoirs: Research and Management, 25*(1), 93–104. https://doi.org/10.1111/lre.12309

Nanda, L. D., Tan, F., & Noer, M. (2018). Tingkat Partisipasi Masyarakat Dalam Program Berkelanjutan Danau Maninjau. *Jurnal Kebijakan Sosial Ekonomi Kelautan Perikanan, 8*(2), 105–115.

Njiru, J. M., Aura, C. M., & Okechi, J. K. (2019). Cage fish culture in Lake Victoria: A boon or a disaster in waiting? *Fisheries Management and Ecology, 26*(5), 426–434. https://doi.org/10.1111/fme.12283

Nobile, A. B., Zanatta, A. S., Brandão, H., Zica, E. O. P., Lima, F. P., Freitas-Souza, D., et al. (2018). Cage fish farm act as a source of changes in the fish community of a Neotropical reservoir. *Aquaculture, 495*(January 2017), 780–785. https://doi.org/10.1016/j.aquaculture.2018.06.053

Ostrom, E., Gardner, R., Walker, J., Agrawal, A., Blomquist, W., Schlager, E., & Tang, S. Y. (1994). *Ostrom CPR.pdf*. The University of Michigans Press.

Oughton, E., & Bracken, L. (2009). Interdisciplinary research: Framing and reframing. *Area, 41*(4), 385–394. https://doi.org/10.1111/j.1475-4762.2009.00903.x

Patrício, J., Elliott, M., Mazik, K., Papadopoulou, K. N., & Smith, C. J. (2016). DPSIR-two decades of trying to develop a unifying framework for marine environmental management? *Frontiers in Marine Science, 3*(SEP), 1–14. https://doi.org/10.3389/fmars.2016.00177

Presentasion of The Head of Agam Regency. (2017). *Pemulihan Danau Maninjau melalui 10 agenda prioritas*. Lokakarya Pengelolaan Danau Berkelanjutan.

Pusat penelitian Limnologi LIPI. (2019). *Policy Brief No 4 tahun 2019*. Retrieved from www.journal.uta45jakarta.ac.id

Putra, Y. M. (2020, March 11). *Misi Selamatkan Danau Maninjau*. Republica.Id. Retrieved from https://www.republika.co.id/berita/q6zlo3284/misi-selamatkan-danau-maninjau

Putri, D. Z., Anis, A., Adry, M. R., & Sari, Y. P. (2020). Economic valuation of Lake Maninjau by using productivity approach. *Progress in Social Science, Humanities, and Education Research Symposium, 5*(5), 122–125. Retrieved from https://series.gci.or.id/article/357/16/psshers-2020

Rajee, O., & Mun, A. T. K. (2017). Impact of aquaculture on the livelihoods and food security of rural communities. *International Journal of Fisheries and Aquatic Studies, 5*(2), 278–283. Retrieved from https://psa.gov.ph/content/fisheries-statistics-philippines

Refsgaard, J. C., van der Sluijs, J. P., Højberg, A. L., & Vanrolleghem, P. A. (2007). Uncertainty in the environmental modelling process – A framework and guidance. *Environmental Modelling and Software, 22*(11), 1543–1556. https://doi.org/10.1016/j.envsoft.2007.02.004

Robinson, K. F., Fuller, A. K., Stedman, R. C., Siemer, W. F., & Decker, D. J. (2019). Integration of social and ecological sciences for natural resource decision making: Challenges and opportunities. *Environmental Management, 63*(5), 565–573. https://doi.org/10.1007/s00267-019-01141-2

Rode, J., Gómez-baggethun, E., & Krause, T. (2015). Motivation crowding by economic incentives in conservation policy : A review of the empirical evidence. *Ecological Economics, 117*, 270–282.

Ruckelshaus, M., McKenzie, E., Tallis, H., Guerry, A., Daily, G., Kareiva, P., et al. (2015). Notes from the field: Lessons learned from using ecosystem service approaches to inform real-world decisions. *Ecological Economics, 115*, 11–21. https://doi.org/10.1016/j.ecolecon.2013.07.009

Ruddle, K., & Davis, A. (2013). Local Ecological Knowledge (LEK) in interdisciplinary research and application: A critical review. *Asian Fisheries Science, 26*, 79–100. https://doi.org/10.33997/j.afs.2013.26.2.002

Said, D. S. S., Chrismadha, T., Mayasari, N., & Badjoeri, M. (2020). Integrated multitrophic aquaculture in Maninjau Lake: Converting eutrophic water into fish meal. *IOP Conference Series: Earth and Environmental Science, 535*(1). https://doi.org/10.1088/1755-1315/535/1/012006

Shava, E., & Gunhidzirai, C. (2017). Fish farming as an innovative strategy for promoting food security in drought risk regions of Zimbabwe. *Jamba: Journal of Disaster Risk Studies, 9*(1), 1–10. https://doi.org/10.4102/jamba.v9i1.491

Smith, C. J., Papadopoulou, K. N., Barnard, S., Mazik, K., Elliott, M., Patrício, J., et al. (2016). Managing the marine environment, conceptual models and assessment considerations for the European marine strategy framework directive. *Frontiers in Marine Science, 3*(AUG), 1–19. https://doi.org/10.3389/fmars.2016.00144

Steffen, W. (2009). Interdisciplinary research for managing ecosystem services. *Proceedings of the National Academy of Sciences of the United States of America, 106*(5), 1301–1302. https://doi.org/10.1073/pnas.0812580106

Swearer, S. E., Morris, R. L., Barrett, L. T., Sievers, M., Dempster, T., & Hale, R. (2021). An overview of ecological traps in marine ecosystems. *Frontiers in Ecology and the Environment, 19*(4), 234–242. https://doi.org/10.1002/fee.2322

Termeer, C. J. A. M., Dewulf, A., & Biesbroek, R. (2019). A critical assessment of the wicked problem concept: Relevance and usefulness for policy science and practice. *Policy and Society, 38*(2), 167–179. https://doi.org/10.1080/14494035.2019.1617971

The Head of Agam Regency. (2021). *Dukungan Pelaksanaan Penyelamatan danau Maninjau*. Lubuk Basung.

Tobi, H., & Kampen, J. K. (2018). Research design: The methodology for interdisciplinary research framework. *Quality and Quantity, 52*(3), 1209–1225. https://doi.org/10.1007/s11135-017-0513-8

van Voorn, G. A. K., Verburg, R. W., Kunseler, E. M., Vader, J., & Janssen, P. H. M. (2016). A checklist for model credibility, salience, and legitimacy to improve information transfer in environmental policy assessments. *Environmental Modelling and Software, 83*, 224–236. https://doi.org/10.1016/j.envsoft.2016.06.003

Van-Houtte, A. (2001). Establishing legal, institutional and regulatory framework for aquaculture development and management. In R. P. Subasinghe, P. Bueno, M. J. Phillips, C. Hough, S. E. McGladdery, & J. R. Arthur (Eds.), *Technical proceedings of the conference on aquaculture in the third millennium* (pp. 103–120). NACA, Bangkok and FAO, Rome.

Vedeld, P., Jumane, A., Wapalila, G., & Songorwa, A. (2012). Protected areas, poverty and conflicts. A livelihood case study of Mikumi National Park, Tanzania. *Forest Policy and Economics, 21*, 20–31. https://doi.org/10.1016/j.forpol.2012.01.008

Vollan, B. (2008). *Socio-ecological explanations for crowding-out effects from economic field experiments in southern Africa*, 7. https://doi.org/10.1016/j.ecolecon.2008.01.015

Vuye, C., Bergiers, A., & Vanhooreweder, B. (2016). The acoustical durability of thin noise reducing asphalt layers. *Coatings, 6*(2), 1–19. https://doi.org/10.3390/coatings6020021

Williams, P. J., & Hooten, M. B. (2016). Combining statistical inference and decisions in ecology. *Ecological Applications, 26*(6), 1930–1942. https://doi.org/10.1890/15-1593.1

Yuniarti, I. (2021). *Socio-ecological dimensions of sustainable tropical lake management – Lessons Learned from Interdisciplinary Research in Lake Maninjau, Indonesia.* Unpublished thesis. University of Edinburgh.

Yuniarti, I., Barnes, C., Glenk, K., & Sutrisno. (2021a). Challenges for the development of environmentally sustainable cage culture farming in Lake Maninjau, Indonesia: An institutional perspective. *Ecosystems and People, 17*(1), 248–263. https://doi.org/10.1080/26395916.2021.1921848

Yuniarti, I., Glenk, K., Yusri, S., & Sutrisno. (2021b). Application of Maximum Entropy Model to analyze cage aquaculture effects on the distribution of native fish species in Lake Maninjau, Indonesia. *Aquaculture, in progres*.

Yuniarti, I., Glenk, K., McVittie, A., Nomosatryo, S., Triwisesa, E., Santoso, A. B., & Ridwansyahb, I. (2021c). An application of Bayesian belief network to assess management scenarios for aquaculture in a complex tropical lake system in Indonesia. *PLoS One, 16*(4), 1–23. https://doi.org/10.1371/journal.pone.0250365

Zhou, H., Jiang, C., Zhu, L., Wang, X., Hu, X., Cheng, J., & Xie, M. (2011). Impact of pond and fence aquaculture on reservoir environment. *Water Science and Engineering, 4*(1), 92–100. https://doi.org/10.3882/j.issn.1674-2370.2011.01.009

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Part III
Land and Forest

Chapter 8
Community-Based Fire Management and Peatland Restoration in Indonesia

Laely Nurhidayah, Rini Astuti, Herman Hidayat, and Robert Siburian

Abstract Indonesia suffers from recurrent land and forest fires due to anthropogenic disturbances, such as land clearing and peatland drainage for agricultural activities and expansion of large-scale plantation. The Indonesian government launched a restoration program in 2016 to restore degraded peatlands and prevent fires. Community Fire Brigades or *Masyarakat Peduli Api* (MPA) is the forefront actor in community-based fire management and plays a significant role in fire prevention and peatland restoration at the local level in Indonesia. This paper examines community's perspectives and opinions on the role and challenges of community-based fire management and peatland restoration. The paper draws from case studies of six villages situated at two fire-prone provinces in Riau and Central Kalimantan, Indonesia. We employ the cohesive fire management strategy model as a lens to understand the challenges and effectiveness of a community-based fire management strategy in Indonesia. The cohesive fire management strategy focuses on three key areas: creating a resilient landscape, developing fire adaptive communities, and implementing a fire management strategy. We found that MPAs face diverse chal-

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lenges that reduce their capacity to prevent and control forest and land fires. One of the most common challenges faced by the MPAs is the lack of financial support for routine operation and maintenance of peatland rewetting infrastructures. Meanwhile, at the broader community level, the absence of affordable no-burning technology for land clearing and the lack of reward and punishment system have hampered efforts to reduce fire incidents. We suggest that the Indonesian government prioritizes funding support for MPAs to ensure the effective operationalization of community-based fire management in fire-prone provinces. We also suggest the need for the private sector and NGOs to step in to address the gap in support for community-based fire management and peatland restoration.

Keywords Community-based fire management · Peatland restoration · Cohesive management strategy · Collaboration

8.1 Introduction

Indonesia suffers from recurrent land and forest fires due to extractive activities including clearing and burning peatland for large- and small-scale agriculture expansion, including encroachment of state forests for illegal plantations (Astuti et al., 2022). There have been many studies on community-based fire management in Indonesia (Nurhidayah, 2014; Nurhidayah, 2013; Suyanto et al., 2002). This paper contributes to this growing literature on fire governance by examining the challenges faced by MPAs despite existing peatland restoration programs in the community. Responding to the widespread fires in 2015, President Joko Widodo launched a program in 2016 to restore degraded peatland and prevent the recurrence of land and forest fires through the establishment of Peatland Restoration Agency (Badan Restorasi Gambut or BRG) (Astuti, 2020). The BRG was tasked to restore 2 million hectares of degraded peatland for five years, from 2016 to 2020. Despite failing to achieve its mandate (Astuti et al. 2020), BRG's work has been extended for another four years until 2024. President Joko Widodo broadened BRG's task to also include the restoration of degraded mangroves and changed the agency's name to Peatland and Mangrove Restoration Agency (Badan Restorasi Gambut dan Mangrove/BRGM).

Peatland fires contribute to greenhouse gas emissions, exacerbate climate change, endanger human health, and cause economic loss (Miller et al., 2021). Peatland restoration is a way to mitigate the risk of forest fires (Henry, 2021). The BRG's key strategy in restoring peatlands is through the 3R program: rewetting dry peatlands, revegetation with endemic plants, and revitalization of community livelihoods. According to the BRG, peatland restoration aims not only to restore the ecological conditions of peatlands but also to improve the community's social-economic conditions through sustainable livelihoods. Stakeholders' engagement is crucial in

successfully implementing the 3R program. The community fire brigade (MPAs) is one of the critical stakeholders implementing the 3R program. The involvement of the MPAs in peatland management and conservation is crucial in the establishment of *Desa Peduli Gambut* (DPG-Peat care villages) – a BRG's key strategy in implementing the 3R program at the community (village) level. In short, MPAs play a significant role in the revegetation and livelihood restoration activities as well as rewetting efforts. Rewetting is the process of restoring natural water flow and saturating peatland, which can reduce greenhouse gas emissions, slow subsidence, and reduce wildfire risk.

Drawing from the cohesive fire management strategy framework, this chapter examines the role and challenges of community-based fire management and peatland restoration. The case study was conducted in two fire-prone provinces, Riau and Central Kalimantan, in 2019. We interviewed local community members and MPAs in six villages, including Rimbo Panjang, Temusai, and Lukun villages in Riau Province. In Central Kalimantan, we conducted the study in Tumbang Nusa, Simpur, and Sidodadi villages. We interviewed a total of 60 members of MPAs in six villages and conducted focus group discussions with a representation of local communities who participated in the BRG's 3R program. We interviewed local government officials from the Regional Disaster Management Agency (BPBD), the Manggala Agni, and the Regional Team of Peatland Restoration Task Force (TRGD). We also interviewed NGOs, such as Kemitraan (Partnerships) and academics to understand the challenges of peatland governance and coordination effort at the local level.

The rest of this chapter is divided into four sections. The following section provides the literature review on the fire prevention, preparedness, and suppression model. The third section outlines our case study areas in Riau and Central Kalimantan Provinces. The fourth section emphasizes our research findings, followed by a discussion in section five. The sixth section concludes the paper.

8.2 Community-Based Forest Fire Prevention, Preparedness, and Suppression Model

With the increase in incidents of forest fires, the involvement of local people is seen as a crucial element of community-based fire prevention, preparedness, and suppression (Paton et al., 2013). Researchers have highlighted the significance of the community-based fire management (CBFiM) by clearly stating that the community is the key to the survival of forests through the integration of indigenous knowledge, conservation values, and sustainable development (Paton et al., 2013). Community-based fire management has emerged as an alternative framework that promotes a bottom-up approach (Croker, 2020). Zhang defines CBFiM as "an approach in which villagers have shown a profound understanding of fire prevention and control and have participated voluntarily in fire management" (FAO, 2011).

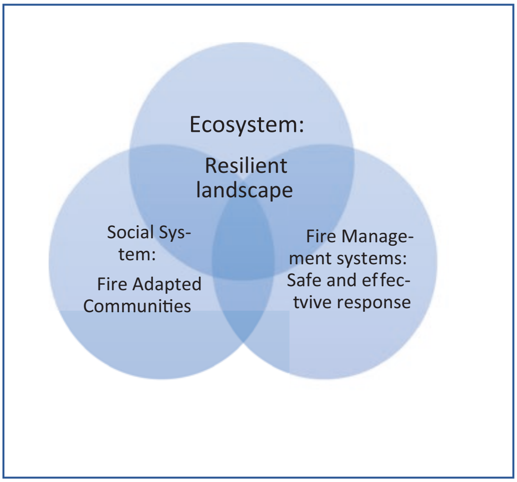


Fig. 8.1 Model of cohesive fire management strategy. (Source: US Forest Service, 2021)

We draw from the model of the cohesive management strategy (Fig. 8.1) as a lens to understand the challenges and effectiveness of a community-based fire management strategy in Indonesia. This model represents a holistic human and nature relationship. We use this model to represent broad challenges of land and forest fire management that need to be addressed, including the ecosystem, human or social system, and fire governance (US Forest Service, 2021). In addition, a study on cohesive management strategy can be used to identify areas of weaknesses and strengths in fire responses and how this evaluation can facilitate social learning, adaptation, and ultimately more resilient socio-ecological forest fire response institutions (Steelman and Nowell, 2018). We also assess the implication of the peatland restoration program under Jokowi's administration in strengthening the capacity of local communities to deal with the fire problem. We do this by assessing the link between the BRG's 3R program (rewetting, revegetation, and revitalization) with the MPAs' works at the community level.

The cohesive fire management strategy model defines three interrelated areas for effective land and forest fire prevention. These three elements are ecosystem toward a resilient landscape, a social system through fire-adapted communities, and a fire management system with a safe and effective response. In understanding a resilient landscape, we follow IUCN's proposition that human well-being is directly related to the presence of a healthy environment (IUCN, 2021). IUCN promotes a strategy called the ecosystem approach for an integrated management of land, water, and living resources that promotes conservation and sustainable resource use in an equitable way (CBD, 2021). The ecosystem approach recognizes that humans are an integral component of ecosystems (CBD, 2021). Ecosystem restoration is one of the priorities in the ecosystem approach. Ecosystem restoration is defined as "the process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity." Ecosystem restoration encompasses a broad continuum of practices, depending on local conditions and societal choices (UNEP, 2021). The

end goal is to achieve a resilient landscape. With its explicit focus on creating robust systems to persist and adapt over the long run, the concept of resilience has emerged as a critical way to manage ecosystems to sustain biodiversity and ecological functions in an uncertain future.

The second component of the model is the social system with the goal to achieve fire adaptive communities. The National Wildfire Coordinating Group defines the fire-adapted community as "A human community consisting of informed and prepared citizens collaboratively planning and taking action to coexist with wildland fire safely" (US Forest Service, 2021). In this research, we examine community-based fire reduction strategies and whether the communities in our research have adopted risk reduction behaviors through the 3R program. The third component of the model is the fire management systems with a safe and effective response. In this case, we define the fire management system as related to the capability and availability of fire suppression resources. These resources include human resources, equipment, funding, knowledge, and training. In this paper, we use this framework for a cohesive fire management strategy to analyze the BRG's 3R program implementation at the local level and whether the program facilitates MPA's work in achieving peatland resilient landscape.

8.3 Research Locations

We conducted research in two fire-prone provinces: Riau and Central Kalimantan. Riau Province is one of the seven priority provinces of the BRG's peatland restoration target. Every year wildfires sporadically ravage certain areas of 10 out of the province's 12 districts. Many oil palm plantations grow in peatland areas in Riau. Interviewees indicated the use of fire for land clearing as the main cause of annual land and forest fires. An investigation by an environmental NGO indicates that approximately 1.4 million hectares of forest area in Riau have been planted with oil palm trees (Beller et al., 2016). This figure shows that more than 27% of the total forest area in Riau has been converted into palm oil plantations. The conversion of forest areas into mono-agricultural areas shows the role of large plantation industries in changing and degrading peatland landscapes (Astuti, 2021).

In Riau Province, we conducted research in three villages. The first village is Lukun Village in Meranti Islands District. The majority of the population (80%) is Malay. The community's main livelihood is from planting sago (rumbia), rubber, and endemic/local trees such as gerunggang (*Cratoxylon arborescens* (Vahl), punak (*Tetrameristra glabra*), balangeran (*Shorea balangeran*), galam (*Melaleuca cajuputi* subsp. *Cumingiana*), and Nimbung (*Oncosperma tigillarium*). Javanese, Banjar, Bugis, and Nusa Tenggara Barat (NTB) migrants entered in 1956–1970 through the transmigrasi program. The migrants were more interested in growing rubber trees. Due to recurrent forest fires, Lukun village has become the BRG's target for peatland restoration through the peat care village program. The second village is Temusai in Siak District. Temusai village is mostly inhabited by people

with Javanese ethnicity who make up about two third of the total population of 1,450 people in 2019. The third village is Rimbo Panjang in Kampar District, which borders Pekanbaru City, the capital city of Riau Province. Rimbo Panjang village consists of mostly Malay ethnic with the majority of the population coming from the Pariaman District in West Sumatra.

Central Kalimantan province is also one of the BRG's priority provinces for peatland restoration. Central Kalimantan vulnerable peatland areas are heavily degraded due to the conversion of peatland to large-scale plantations. Research shows more than 58,000 hectares of protected peatlands have been illegally converted into palm oil plantations (Astuti et al., 2022). During the New Order regime, the Pulang Pisau district was subjected to the controversial Mega Rice Project. The project, which started in 1995, has resulted in significant degradation of the fragile peatland ecosystem with more than 4000 km of irrigation canals built to drain peatland. The peatland drainage has become the primary cause of fires and toxic air pollution.

Drawing from qualitative data, we highlight the role and challenges of community-based fire management and peatland restoration at the local level in three villages in Pulang Pisau District, Central Kalimantan. The first village is Tumbang Nusa, which is part of the Kahayan River Basin ecosystem. The village area is divided by the river into eastern and western regions. The second village is Simpur. Similar to Tumbang Nusa Village, Simpur village is also located on the banks of the Kahayan River. The ethnic population in Simpur Village is predominantly Dayak. The third village is Sidodadi Village. Sidodadi is a transmigration settlement unit hosting migrants from the Provinces of West Java, Central Java, and East Java. The village borders with the Sebangau National Park. In the next section, we outline our research findings by highlighting the diverse challenges that the MPAs and local communities face in doing forest fire management. We also outline opportunities in achieving fire-adapted communities by emphasizing communities' diverse social capital and strengths.

8.4 Research Findings: Challenges and Opportunities in Community-Based Fire Management and Peatland Restoration

8.4.1 Challenges in Community-Based Fire Management and Peatland Restoration

Large-Scale Extractive Activities and Peatland Degradation The first challenge on peatland restoration and community-based fire management is the high degree of peatland degradation in all the research areas. Altered peatland landscape due to the large-scale plantation has caused annual fires in Lukun Village. The village location is in border with PT National Sago Prima (NSP) concession in an area called the

Ulu Mahmud. Due to the opening of large-scale plantations, the Ulu Mahmud area is very prone to fire. In 2018 and 2019, the forest fires caused damage to the Ulu Mahmud areas covering more than 800 hectares. Villagers also encroached into the forest area for agricultural activities and often used fire as the cheapest land clearing method.

We also found that the majority of Temusai village landscape has been converted from peatland forest into palm oil plantation. The large-scale land conversion was driven by the boom of the oil palm industries in the Siak Regency. Around 35% of the village area is under private palm oil concession. A network of canals are built to drain peatland to make them more adaptable for palm oil. Consequently, in almost every dry season (July–September), Temusai village suffers from peatland fires. Landscape degradation that is caused by palm oil plantation also occurs in Simpur village in Central Kalimantan.

Small-Scale Extractive Activities and Community Livelihood Interviewees in Lukun have indicated that local villagers are somewhat responsible for the annual forest fires due to smoking (while illegally logging timber in the forest). The interviewees acknowledge that illegal logging has caused damage to the ecosystem, including forest fires. However, raising awareness on the impact of illegal logging is difficult as the environmental damage only affects forests instead of the villagers' house and properties. Based on the interview with respondents, it is difficult to find alternative livelihoods to shift from illegal logging to other activities offered by the revitalization program under the BRG. Several revitalization programs such as bee farming and fish farming have not been successful in changing communities' livelihood due to lucrative opportunities offered under illegal logging.

We also found in Simpur village that some of the canal blocks have been removed by local communities as they are seen to obstruct the community's boat access to the farming areas. Canal blocks are constructed in the community's land as part of the rewetting activities. However, without the proper socioeconomic mapping of the community's relationship with the water canals and a proper informed consent protocol, the restoration program may fail to deliver the intended outcome and instead face opposition from the community.

Partial and Misdirected Restoration Activities We found that almost all villages face a similar problem of a partial restoration program. The community-based peatland restoration funded by the BRG often only addresses a partial area that is prone to fires. Meanwhile, the degree of degradation from the extractive activities is widespread. Consequently, peatland fires still recur even in the communities targeted by the peatland restoration program. We also found that the rewetting strategy through canal blocking has not been working properly due to landscape changing and unavailability of water during dry season as well as community's noncooperation.

Through interviews with local MPAs, we found that restoration activities are often carried out outside the most fire-prone areas. For example, despite suffering from annual forest fires, the Village Forest is not targeted for the rewetting program

due to national regulations that prevent BRG from entering state forest areas. BRG's authority to conduct restoration only covers the area outside of the state forest. The Ministry of Environment and Forestry is the government institution that has the authority and mandate to protect and manage peatland in the state forest.

Local Conflict and Absentee Land Owner Land conflict and lack of responsibility of the absentee owner are indicated as the cause of unmanaged land and forest fires. Fires usually start from and occur on conflicted land or the abandoned land owned by absentee owners. Due to its strategic access, many peatland areas along the main road are sold to investors who do not reside in the village such as occurred in Rimbo Panjang in Riau and Tumbang Nusa village in Central Kalimantan. Almost 50% of land ownership in Rimbo Panjang has been transferred to outside investors. These investors do not live in the vicinity of the village and usually neglect to take care of the land. Consequently, shrubs and grass grew on the neglected lands and easily became fuel for fires during the dry season (July–September). The unmanaged land is prone to fires, and when fire occurs, the absentee owners do not engage in fire suppression activities. We also found similar phenomena of absentee land owners in a neighboring village in Sidodadi and Temusai villages. In addition, according to observation, the social cohesion in many peat care villages may deteriorate due to jealousy between elite(s) who receive the benefit from the peatland restoration program and other local communities excluded from the program.

Difficulty in Finding Affordable No-Burning Technology at the Local Level One of the challenges in creating adaptive communities is the difficulty in finding an alternative cheap method for no-burning technique. According to interviews with locals, to open a hectare of land will cost 7–8 million rupiah with heavy machinery (tractor). The interviews reveal the relatively high cost of practicing no-burning agriculture method. Consequently, some local people still use fire for land clearing.

Our research findings show that the ban on the use of fire for land clearing has reshaped the social relations at the community level and unintentionally exacerbate community's precarious livelihood. For example, in Simpur, most of the villagers work as farmers. The community utilizes peatland areas for rice farming. Due to the prohibition of burning practices, the locals no longer plant rice; instead, they become precarious workers for nearby plantation companies. Moreover, before the fire ban, local communities had strong social cohesion as they usually worked collectively for rice farming. However, due to the prohibition of burning practices, the locals prefer to abandon their land. This has caused a problem as the local community is no longer actively involved in the fire control and prevention. Additionally, interviews with the local community indicate that the locals ignore the fires on their property as they are afraid that they will be accused of igniting the fires. Due to low community involvement, fire control and suppression solely become the MPA's responsibility.

Lack of Funding, Institutional Support, and Fire Suppression Equipment Reduce MPA's Effectiveness in Fire Management We found that the most com-

mon challenges in the fire management system faced by all communities and MPAs are lack of funding and fire suppression equipment. For example, in Lukun, the head of the village highlighted during an interview that the allocation of 30 million rupiah from the Village Fund is barely enough for the operationalization fund and salary for all MPA members who conducted fire suppression for a month. In Temusai, the MPA receives 2 million rupiah annual funding from the BPBD in addition to the village's annual budget of 24 million rupiah funding for MPA. The funding is mainly used for operational costs such as purchasing gasoline or diesel for motorbikes and pumping machines. A member of the Temusai MPA provides an illustration on the cost of firefighting funds. To extinguish fire covering 7–10 hectares area, the MPA will require 5 million rupiah for a week of fire suppression operation. However, if forest fires were to occur on an area of more than 10–30 hectares, the operation cost will be greater. A similar problem is also faced by the village authority in Rimbo Panjang, which has an allocation of 15–20 million rupiah annual budget for fire suppression. Apart from the lack of adequate operational "funds" for quick extinguishing actions such as buying gasoline, diesel, food, and transport costs, the MPAs also often have minimal access to technical equipment such as mobile pumps, tents, and long water hoses.

Due to its voluntary nature, the MPA often only has a limited number of members. Although the village document shows that the local MPA is consisted of 35 members, only 15 to 20 members are currently active in Temusai Village. Many respondents highlight that they rarely receive payment and honorarium despite a big responsibility to prevent forest and land fires. Based on interviews, MPA members in Temusai have proposed the provision of insurance that will cover accidents and death while on duty. Extinguishing forest and land fires is a high-risk activity, and the provision of an insurance scheme is crucial for protecting MPA members. Most of the time, the MPA members are not equipped with proper safety equipment such as gloves, anti-fire clothing, helmets, anti-fire shoes, and masks while on duty. Extended fire suppression task also means that many MPA members have to leave their primary livelihoods while on duty, potentially affecting their household income. Our research findings indicate similar problems in terms of insufficient protection measures for MPA members in Lukun Village. Meanwhile, in the case of Simpur village, the private sector has offered support to the MPA for a joint patrol and fire suppression activities. The collaboration is seen as a win–win strategy for both the private sector and the village.

In Tumbang Nusa, the village has received support in the form of deep well construction. Tumbang Nusa village has received almost 300 deep wells for rewetting in the BRG's peatland restoration program. The deep wells have played a significant role in keeping the peat's moisture during the dry season and preventing fires. The establishment of deep wells benefited the local communities, as they have created jobs for locals and MPAs. However, the communities have faced challenges in maintaining the deep wells due to the lack of maintenance funding. The MPA has initiated seeking the maintenance fund from the Regional Peatland Restoration Team (TRGD). However, due to limited technical capacity and knowledge on how

to deal with complex bureaucratic processes, the MPA's proposal did not meet the TRGD's requirement. Consequently, the MPA was unsuccessful in acquiring funding for deep well maintenance. According to interviews with the local community, only 20% of the deep wells are working properly. The rest are either missing or damaged. This has resulted in many deep wells failing to operate during the 2019 forest fires. This case shows that regulation and complicated bureaucracy may jeopardize land and forest fire prevention.

8.4.2 Opportunities in Community-Based Fire Management and Peatland Restoration

Community's Active Collaboration in Fire Management Our research findings show that a strong social capital can facilitate communities to become adaptive and resilience society. For example, in Temusai a strong kinship rooted in common socio-cultural background has united the village in their responses to forest fires. For example, the village government is willing to allocate village funds to build a reservoir on land donated by the village community. There is also an initiative from communities to rent abandoned land owned by absentee land owners to become productive and to prevent land and forest fires. The local communities are also obeying the prohibition of not fishing in the dry season as it has caused land and forest fires because of irresponsible smoking (dumping cigarette butts) by fishers in canal or stream areas near the peatland. Similar phenomena of strong cohesive community are also shown in Sidodadi village. Local villagers have awareness that their village area is prone to forest fires. Therefore, to anticipate and prevent land and forest fires, the village has local regulations that prohibit burning activities. This local regulation is facilitated by a partnership with the program in peat care villages (DPG). If villagers conduct burning activities and damage their neighbor's land and crops, they are obliged to pay for the damage. In addition, the community also has good social cohesivity and works together with the MPA to develop a fire management system.

Sustainable Livelihood Potential Development of sustainable livelihood that attunes to local potential can facilitate the achievement of adaptive and resilient communities. In Lukun, sago farming can be developed as a tool for peatland restoration due to high interest from the local community. According to the Regulation of the Minister of Environment and Forestry number P.16/MenLHK/Sekjen/Kum.1/2017 concerning Technical Guidelines for the Restoration of Peat Ecosystem Functions, sago is one of the tree species recommended by the government to be planted on peatlands. Sago can grow on wet peatland. Therefore, developing sago crops can be an alternative and sustainable livelihood option for the community. We saw a similar potential in Rimbo Panjang village through the development of local pineapple. Rimbo Panjang has always been known as a famous pineapple producer

in Riau province. The community that manages the land for agriculture, such as pineapple plantations, is usually responsible for preventing fires from occurring on their land. The BRG through the peat care village program has facilitated the development of deep wells in pineapple areas to maintain peatland moisture. The rewetting program has been hugely successful due to the overlap between community's and the government interests in maintaining peatland moisture.

8.5 Discussion and Way Forward

8.5.1 A Cohesive Approach to Community-Based Fire Management

Based on six case studies, we have reviewed the challenges and role of community-based fire management in two provinces in linkage with the peatland restoration program. We examined the condition of the peatland ecosystem in the villages and the adaptive capacity of the communities and analyzed the fire management capability of the villages. In terms of the resilient peatland ecosystem, six case studies in Riau and Central Kalimantan provinces have shown that in all villages, the peatland ecosystems have changed because of anthropogenic activities, due to intensive either small-scale or large-scale plantations. This finding aligns with other research on drivers of peatland degradation in Indonesia (Dohong et al., 2017; Astuti, 2021; Miller et al., 2021). In addition, absentee lands, where the owner is absent, have created additional risk by leaving their lands susceptible to fires. To prevent land and forest fires, peatland restoration is one of the critical measures to achieve ecosystem resilience.

Rewetting the peat is an important step in revegetation and protection of remaining peat carbon stocks (Page et al., 2008). However, our research findings show that the BRG's rewetting activities have some limitations. We found that rewetting infrastructure, such as deep wells, often are constructed far from the most fire-prone areas. We also note that ensuring the sustainability of rewetting infrastructure is a critical issue and can only be achieved when there is a benefit for the community such as in Rimbo Panjang case. In the case of canal block construction, we suggest a genuine process of getting the villagers' informed consent. Otherwise, as we have found from the case studies, the canal blocks are being removed by the villagers who found their water access blocked by the infrastructure. Page et al. (2008) suggest that the successful restoration of degraded peatlands must be grounded in scientific knowledge, relevant to socioeconomic circumstances, and should not proceed without the consent and cooperation of local communities (Page et al., 2008). Lack of maintenance funds for operationalization also creates ineffectiveness in rewetting in the dry season. Therefore, we suggest the village authority prioritize the village fund for the MPA's maintenance and operationalization funding.

The locals require funding and awareness to enable effective efforts to prevent and control land and forest fires. However, the level of awareness and involvement in the community is patchy at best. For example, absentee owners rarely have the responsibility to prevent forest and land fires. In the context where the use of fire is prohibited, local communities stop tending to their lands. Consequently, the banning of burning has the unintended consequence of increased fire risk by creating absentee owners. Our research shows that a village that has a strong and cohesive fire adaptive community is not guaranteed to be free from fires. Our case studies show that despite the high awareness of locals to prevent land forest fires in their village, fires might start from neighboring villages that has occurred in Temusai, Sidodadi, and Tumbang Nusa villages. Therefore, creating cohesive and adaptive fire communities requires a landscape (based on peatland hydrological ecosystem) instead of a jurisdictional (a village-based) approach (Astuti, 2020).

In addition, there should be rewards and punishment for the local villagers who conducted slash and burning activities to establish a deterrence effect (Nurhidayah, 2019). For example, the reward could be in the form of an incentive given to MPAs or local communities who can prevent land and forest fires in their villages. The BRG's revegetation and revitalization program could be used as an incentive (grant or funding to establish sustainable alternative livelihood suitable with local potential), for example, promoting paludiculture and sustainable farming in peatland villages. Inclusion of all local communities is the key to sustainable livelihood and fire prevention. Meanwhile, punishment can be conducted at the village level by tapping into customary law that exists in the communities. Promotion of nonburning technology and alternative livelihood that locals can accept are also crucial in creating fire adaptive communities. Paludiculture is considered a sustainable peatland management practice involving plant cultivation in wet conditions with adaptive plants, such as *purun* and sago (Budiman et al., 2020).

8.5.2 Collaboration and Engagement of Diverse Stakeholders in Community-Based Fire Management and Peatland Restoration

While the MPA is the first and initial responder of the firefighter in the village, other actors such as BPBD, Manggala Agni, Babinsa, and the local police play a critical role in providing assistance when the fires become uncontrollable at the village level. Despite this critical role in fire suppression, the deployment of these firefighter forces is hindered by long bureaucracy and regulation. For example, according to interviews with informants, BPBD from the regency level will only be deployed if the Head of Regency has issued an emergency status. To be declared emergency status, it requires land and forest fire occurrence in four to five villages. Similarly, at the provincial level, the fire forces will only be deployed when the governor issues an emergency status at the provincial level. According to an

interview with an informant, the issuance of the provincial emergency status requires three to four districts to be affected with fires. These bureaucracies hinder a fast and effective response from all stakeholders involved in preventing and controlling land and forest fires.

In addition, most local governments in fire-prone areas do not allocate particular budgets for forest fire mitigation (Secha, 2021). Therefore, when fires occur, they have to draw from the emergency funds intended for natural disasters. The emergency funds can only be used for fire suppression and do not cover fire prevention. We therefore suggest that the local government look at the potential of using reforestation funds for fire prevention activities, including for the MPA support. Government Regulation No. 35/2002 has allowed this fund to be used for forest fire control and management (Febrianto, 2019). Special budgeting has to be allocated for the MPA either from the local government annual budget or the village fund. In addition, the private sector and NGOs can step in to address the gap in support for community-based fire management and peatland restoration. While in our research we found that the Kemitraan has been involved in the capacity building for the MPAs during the first stage of the peatland restoration program in Central Kalimantan, we do not find a similar level of support in the Riau Province.

8.6 Conclusion

Community-based fire management remains a critical element for Indonesia's land and forest fire prevention and control. The critical role of the MPA in fire prevention and control is shown during the peatland restoration program. Despite this critical role, the effectiveness of the MPAs in delivering their duties is hindered by many aspects. Our research findings show that the MPA suffered from inadequate funding, lack of insurance and salary, and inadequate fire suppression equipment. We also found that the MPAs faced long and complicated bureaucracies when they sought assistance during fire suppression events. Lack and delay of funding for rewetting of dry peatland and to perform maintenance of the existing rewetting infrastructures such as deep wells and canal blocks has hindered land and forest fires prevention and control as many deep wells failed to operate during 2019 land and forest fires. Two other factors also contribute to the challenges in effectively delivering fire prevention and suppression, including the degradation of the peatland ecosystem and the lack of community adaptiveness to forest fires. The promotion of reward and punishment to the local villagers to prevent slash and burning activities and the promotion of cheap and reliable no-burning technology will be the key in achieving adaptive and resilient communities. These complex challenges need to be addressed by improving the 3R program in the future peatland restoration program.

We also highlight the complexity of Indonesian "emergency" bureaucracy, which has hindered the delivery of effective fire suppression activities. Improving collaboration among stakeholders, such as BPBD, Manggala Agni, the private sector, and NGOs, will contribute further to effectively delivering a fast response in tackling

peatland fires, especially during the *El Nino* season. Therefore, overlapping regulation between sectoral institutions has to be harmonized to allow a quicker and coordinated response toward forest fire prevention. A holistic reform to reduce sectoral silo in the implementation and engagement of all stakeholders, including the private sector and NGOs, is needed to ensure the effectiveness of community-based fire management and peatland restoration programs. This study suggests that a holistic reform and engagement of all stakeholders are needed to ensure the effectiveness of community-based fire management and peatland restoration programs and to achieve a resilient community.

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References

Astuti, R., Miller, M., McGregor, A., Sukmara, M. D. P., Saputra, W., Sulistyo, & Taylor, D. (2022). Making illegality visible: the governance dilemmas created by visualising illegal palm oil plantations in Central Kalimantan, Indonesia. *Land Use Policy, 114*. https://doi.org/10.1016/j.landusepol.2021.105942

Astuti, R. (2021). Governing the ungovernable: the politics of disciplining pulpwood and palm oil plantations in Indonesia's tropical peatland. *Geoforum, 124*, 381–391.

Astuti, R. (2020). Fixing flammable forest: The scalar politics of peatland governance and restoration in Indonesia. *Asia Pacific Viewpoint, 61*(2), 283–300.

Astuti, R., Taylor, D., & Miller, M. (2020). *Indonesia's Peatland Restoration Agency gets extension despite failing to hits its target: What are the hurdles and next strategies?* The Conversation. https://theconversation.com/indonesias-peatland-restoration-agency-gets-an-extension-despite-failing-to-hit-its-target-what-are-the-hurdles-and-next-strategies-151989

Beller, E., Robinson, A., Grossinger, R., Letitia, Spotswood, E. (2016). *Operationalizing landscape resilience: Enhance biodiversity and ecological function at landscape scale*. https://www.sfei.org/sites/default/files/biblio_files/AGU_ResilienceFW.pdf

Budiman, I., Bastoni, Sari, E., Hadi, E., Asmaliyah, Siahaan, A., Januar, R., & Hapsari, R. (2020). Progress of paludiculture projects in supporting peatland ecosystem restoration in Indonesia. *Global Ecology and Conservation, 1*.

CBD. (2021). *Ecosystem approach.* https://www.cbd.int/ecosystem/

Croker, A. (2020). "*Community-based fire management": A colonial narrative?* Institutions, Governance, and Policy for Addressing Fire Challenges Across East and Southern African Savanna Ecosystem. https://www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/centre-for-environmental-policy/public/Abigail-Croker-Poster.pdf

Dohong, A., Aziz, A. A., & Dargusch, P. (2017). A review of the drivers of tropical peatland degradation in South-East Asia. *Land Use Policy, 69*, 349–360. https://doi.org/10.1016/j.landusepol.2017.09.035

FAO. (2011). Community based fire management a review. *FAO Forestry Paper, 166*. https://www.fao.org/3/i2495e/i2495e.pdf

Febrianto, F. (2019, September 28). *Kebakaran hutan pemda belum maksimal gunakan dana reboisasi*. https://bisnis.tempo.co/read/1253400/kebakaran-hutan-pemda-belum-maksimal-gunakan-dana-reboisasi

Henry, D. (2021, April 20). *Peatland fires in Indonesia can be predicted by new evaluation approach, scientist say*. https://forestsnews.cifor.org/72196/peatland-fires-in-indonesia-can-be-predicted-by-new-evaluation-approach-study-finds?fnl=en

IUCN. (2022). *Sustainable landscapes and Resilience ecosystem*. https://www.iucn.org/regions/mediterranean/our-work/sustainable-landscapes-and-resilient-ecosystems

Nurhidayah, L. (2014). Community Based Forest Fires Management in Indonesia: A Legal Analysis and Case Study in South Sumatra and Central Kalimantan Provinces. *Lawasia J, 59*(P), 59.

Nurhidayah, L. (2013). Legislation, regulations, and policies in Indonesia relevant to addressing land/forest fires and transboundary haze pollution: A critical evaluation. *Asia Pacific Journal of Environmental law, 16*, 215.

Nurhidayah, L. (2019). *4 Steps the Indonesian government can take to ensure locals help put out forest fires*. The Conversation. https://theconversation.com/4-steps-the-indonesian-government-can-take-to-ensure-locals-help-put-out-forest-fires-126330

Makarabhirom, P., Ganz D, & Onprom, S. (2004). *Community involvement in fire management: Cases and recommendations for community-based fire management in Thailand*. https://www2.fire.uni-freiburg.de/Manag/CiF-Ch-2-Thailand.pdf

Miller, M., Alfajri, A., Astuti, R., Grundy-Warr, C., Middleton, C., Tan, D. Z., & Taylor, D. (2021). Hydrosocial rupture: causes and consequences for transboundary governance. *Ecology and Society, 26*(3), 21.

Page, S., Agata, Hoscilo, H., Wosten, J., Jauhiainen, Marcel, S., Rieley, J., Ritzema, H., Tansey, K., Graham, L., Vasander, H., & Suwindo, L. (2008). Restoration ecology of lowland tropical peatlands in Southeast Asia: Current knowledge and future research direction. *Ecosystem*, 888–905.

Paton, D., & Tedim, F. (2013). *Enhancing forest fires preparedness in Portugal: Integrating community engagement and risk management*. GRF Davos, Planet@Risk. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.928.7304&rep=rep1&type=pdf

Secha, K. (2021, 15 February). *Mendagri Ungkap daerah rawan karhutla tidak punya dana penanganan kebakaran.* Detik. https://news.detik.com/berita/d-5724791/mendagri-ungkap-daerah-rawan-karhutla-tak-punya-dana-penanganan-kebakaran

Steelman, T., & Nowell, B. (2018). Evidence of effectiveness in the Cohesive Strategy: Measuring and improving wildfire response. *International Journal of Wildland Fire, 28*(4), 267–274.

Suyanto, S., Applegate, G., & Tacconi, L. (2002). Community-based fire management, land tenure and conflict: insights from Sumatra, Indonesia, No.RAP Publication 2002/25. In P. Moore, D. Ganz, L. C. Tan, T. Enters, & P. B. Durst (Eds.), *Communities in flames: proceedings of an international conference on community involvement in fire management* (pp. 27–32). FAO Regional Office for Asia and the Pacific.

UNEP. (2021). *Principle for ecosystem restoration to guide the United Nations decade 2021–2030*. http://www.fao.org/3/cb6591en/cb6591en.pdf

US Forest Service. (2021). *National cohesive wildland fire management strategy.* https://www.fs.fed.us/restoration/cohesivestrategy.shtml

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Chapter 9
Assessing the Governance Modes of Indonesia's Forest Management Unit

Ramli Ramadhan, Soetrisno Karim, Micah R. Fisher, Harsanto Mursyid, and Mochamad Indrawan

Abstract Discussions about forestry governance systems in Indonesia have always been an important area of policy and practice given the sector's outsized role in natural resources management. In recent years, the forest management system has been intimately linked to the concept of a Forest Management Unit (FMU), which was established to conduct scientifically sound forest management practices. FMUs were created in response to the historical failures of rule-based forest management and privatization, which resulted in the emergence of the notion of professional forestry. However, forest governance systems are once again changing as a result of the aftermath of Indonesia's Job Creation Act (a.k.a. Omnibus Law) and its derivative regulations. In this chapter, we apply a governance approach for assessing anticipated changes in the forestry sector. We understand governance as a process operationalized by actors, powers, and rules. Accordingly, we applied the lens of four governance modes in our analysis, which includes hierarchical governance, closed co-governance, open co-governance, and self-governance. FMUs assist the central government as a facilitating institution and provide a window into understanding ongoing forestry changes. Policy changes indicate that nongovernment actors are gaining increased access to permit-based forest use, thus potentially

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replacing the envisioned role of FMUs as key actors at the site level. Nevertheless, although forest use is increasingly being entrusted to nongovernment actors, governance will remain hierarchical, wherein the central government serves as the dominant actor enacting regulatory mechanisms and guiding actor interactions and participation. As a result, we show that previous modes of forestry sector governance are likely to endure and deepen in the post-Omnibus era.

Keywords Forest management unit · Governance · Omnibus law

9.1 Introduction

The emerging forest sector agenda aims to transform governance modes to achieve concrete solutions to current problems. Historically, the forestry sector approached management systems from a scientific rather than a social science perspective (Larson et al., 2021). This has created persistent challenges that will continue as long as forest governance remains ignored (Maryudi et al., 2018). A governance framing helps us to understand the way potential interventions affect policies, institutions, and behaviors (Rahman et al., 2018). Such a perspective also allows us to explain the way government and nongovernment actors can collaborate to address challenging social issues in the forestry sector. Nevertheless, governance is a complex concept with many constituent parts. There are also often competing explanations for the broader determinants of governance (Arnouts et al., 2012).

In this chapter, we center our analysis around evaluating the dynamics of forest governance since the establishment of the crucial decentralizing institution of the Forest Management Unit (FMU). We extend the analysis to examine current regulatory reforms taking place under the National Workforce Development Act, popularly known as the Omnibus Law. Many observers believe that the Omnibus Law could have significant impacts on the institutions governing the forestry sector. We are also interested in extending the concept of governance models in the context of forest management. Studies on governance and FMUs are important because FMUs were established to serve as the lowest level implementing institution, at once promising improved service delivery while also accruing more benefits locally. This research thus positions governance at the center of understanding how FMUs are changing and how they might better chart out a pathway for desired improvements in the forestry sector. First, we turn to a brief history of institutional change in Indonesia's forestry sector.

9.1.1 A Brief History of the Indonesian Forestry Sector: Toward FMU Establishment

Immediately after obtaining independence from the Dutch colonial administration in 1945, forests came to be treated as reserves by then President Sukarno (Barr et al., 2006). When the New Order[1] came to power in the mid-1960s, the government faced significant capital shortages, which led to a dramatic escalation of policies around the development and foreign investment in the forestry sector. These policies were guided through the passing of Law 1 of 1967 concerning Foreign Investment (*Penanaman Modal Asing* or PMA) and Law 5 of 1967 over the Main Provisions of Forestry (*Ketentuan-Ketentuan Pokok Kehutanan*) (Awang, 2003; Barr et al., 2006). The government thereafter authorized Forest Concession Rights (*Hak Pengusahaan Hutan* or HPH), granting "Forest Exploitation Rights" to the private sector for up to a 20-year period. This facilitated the private sector's dominance of forest exploitation, enacted through state-based and company-based systems that lasted between 1967 and 2001. The economic consequences of governance through market dominance gave rise to the so-called "forestry crisis," indicative of alarming rates of deforestation (Sunderline & Resosudarmo, 1996). According to FAO and JRC (2012), forest cover decreased from 74% to 56% between the 1970s and 1990s, mainly from commercial logging activities. During that period, annual deforestation rates increased from 300,000 to about one million ha/year (FWI/GFW, 2001; Tacconi et al., 2019; World Bank, 1997). By 1997, average deforestation rates had increased to 1.6 million ha/year (FWI/GFW, 2001) (see Fig. 9.1).

Regime change with the fall of the New Order in 1998 did little to slow deforestation rates, as new drivers for deforestation began to emerge. A democratic decentralization governing framework led to local governments granting smaller scaled concession permits that caused additional spikes in deforestation rates (Barr et al., 2006).

In 1999, the enactment of Law 41 on Forestry reaffirmed the central government's role as the main actor in forest governance (Peluso, 2007). Even in the context of decentralization of Indonesia's institutions, Law 41 of 1999 vested limited authority to local governments (Resosudarmo, 2004). Furthermore, the new forestry law emphasized a state-control paradigm and a management system based on centralized regulations and bureaucracy (Moeliono et al., 2008). The Forest Concession Rights were then revoked and replaced with a Timber Forest Concession Permit (*Izin Usaha Pengusahaan Hutan Kayu* or IUPHK). Under the HPH concession right, the owner has the right to control the forest with the full authority vested by the government. This is not the case with IUPHHK, however, in which the private sector applies for a permit. This is equivalent to a business license and no longer functions as a right, shaping new forms of patron–client relationships. As a result of this transformation, forest governance is now dominated by a rules-based

[1] The New Order Government came to power through a "silent coup" in 1966, and its orchestrator Soeharto remained in power as president for the next 32 years until his ouster in 1998.

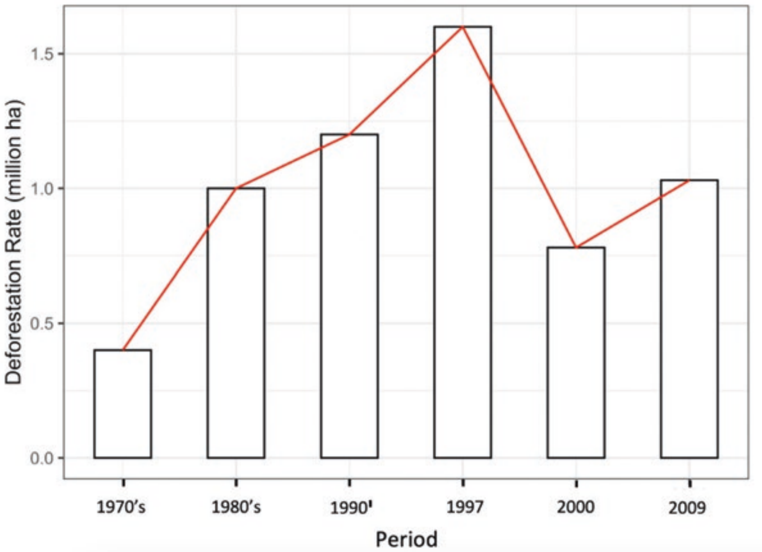


Fig. 9.1 Estimated average deforestation rate in Indonesia from 1970 to 2009

bureaucracy. However, this shift in dominance has had no impact on the state of forest governance. If private dominance as a thesis fails to produce the desired forest governance, and the antithesis of bureaucratic domination has no significant effect on governance, the concept of professional forestry is considered a synthesis of dissatisfaction with market forces and bureaucracy. The existence of a Forest Management Unit (FMU or *Kesatuan Pengelolaan Hutan*) emphasizes the concept of professional forestry.

Indonesia's FMUs were established in 2007 in response to Government Regulation (GR) number 6, which sought to address forest governance, plan preparation, and forest utilization. FMU establishment at that time was motivated by a number of factors, including the lack of an institution that oversees forest management on a site-by-site basis and the government's desire to ensure sustainability over forests. Additionally, proponents hoped FMUs could serve as a catalyst for improving historically poor forest management approaches in various regions (Hernowo & Ekawati, 2014; Moeliono et al., 2008). A Ministry of Forestry (2012) report explains that the overall objective of the FMU policy unit is to provide certainty about (1) forest management work areas, (2) management responsibilities, and (3) forest management planning, which is a prerequisite for sustainability. The government's desire to establish a site-by-site institution was motivated by the fact that the rates of deforestation at that time remained high, especially outside of Java.

The failure of market-based forest development models and the dominance of the bureaucracy raised the profile of FMUs as a site-level institution able to manage forests professionally. FMUs are designed to be able to manage forests based on

facts and science. However, since its establishment in 2007, FMUs encountered many obstacles to these goals. Originally placed under district-level authority, FMUs were withdrawn to the provincial scale due to a tug of war for power that unfolded in the preparation of Law 23 of 2014 concerning Regional Government (Putro & Nawir, 2018). Some regions believe that the establishment of FMUs would increase the local bureaucracy's complexity. Indeed, as a result of recentralization, forest management approaches have become further fragmented between central and local governments (Moeliono et al., 2008). Some analysis shows that the institutional growth of FMUs did not necessarily result in the implementation of an effective management system; instead, it resulted in overlapping tasks and functions (Pratama, 2019). The FMU organization continues to face challenges throughout its development. For example, not all local governments support FMUs as an institution because their organizational activities require local budgets (Soedomo, 2017). The majority of local governments still see that duties and functions between the forestry agency and FMUs differed only slightly (Hernowo & Ekawati, 2014).

In 2020, the future of FMUs and modes of forestry governance face renewed structural change. President Jokowi's administration issued Act 11 of 2020 regarding Employment Creation (popularly known as the *Omnibus Law*). The Omnibus Law prioritizes debureaucratization and deregulation. These policy changes are aimed at reducing bureaucratic inertia, especially for forest management. The government has since issued GR 23 of 2021 concerning Forestry Implementation. This Government Regulation regulates the role and function of FMUs and reviews the relevance of the institution. In light of these changes, the questions that drive this chapter are: Do FMUs operate according to the initial concept of an independent organization responsible for on-site forest governance? Furthermore, amid ongoing policy changes in the forestry sector, what do these changes tell us about different modes of governance? This chapter will address these questions by discussing the current status and role of FMUs as a governing institution. We apply one case study for analytical grounding by examining the development of the Yogyakarta FMU.

This chapter proceeds as follows. Section 9.2 describes various concepts of establishing an FMU. The concept and function of FMUs are determined in accordance with the evolving regulations. The third section discusses changing governance structures onset by the Omnibus Law. The fourth section discusses actors in forest governance. The concluding section reflects on the implications of selected governance modes for forest management at the subnational level.

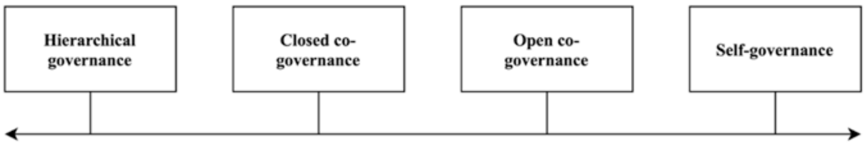


Fig. 9.2 Four governance modes continuum. (Based on Arnouts et al. (2012) and Kooiman (2003))

9.2 Governance and Operationalization Mode

Self-governance is a mode of governance that refers to the capacity of people to govern themselves autonomously. In addition, this mode of operation is consistent with the trend of public intervention through deregulation or privatization (Kooiman, 2003). Co-governance is a mode of governance that emphasizes collaboration and coordination. This mode of governance can be described as a horizontal mode, in which actors collaborate without a dominating central government (Kooiman, 2003). However, this mode is considered insufficient to adequately explain how government and nongovernment actors collaborate. Consequently, this mode is classified as either a closed co-governance or open co-governance system. Closed co-governance is defined as structured governance regardless of the presence of nongovernmental actors. Open shared governance is defined as a more autonomous and adaptable mode of governance based on established networks of actors (Arnouts et al., 2012). Finally, hierarchical governance is synonymous with top-down governance. In addition, this mode is a process in which the dominant actor exercises control over the subordinate actor (Kooiman, 2003).

Borrowing from Kooiman's (2003) governance mode modified by Arnouts et al. (2012), Fig. 9.2 presents its constituent parts.

Governance is essentially about determining the extent to which government and nongovernment actors are involved in governing. The term "mode of government" refers to the various ways processes of governing are carried out. A governance mode is referred to as a set of governance arrangements, with policy discourse serving as the substance. The operationalization of the concept of governance in this chapter takes advantage of the characteristics of actors, powers, and rules (Arnouts et al., 2012) (see Fig. 9.3). On the actor dimension, we observe the formation of coalitions between actors (Lange et al., 2013). We consider both governmental and nongovernmental actors when examining the dimensions and roles of actors. In the power dimension, we examine the resources that are owned or can be mobilized by actors, such as FMUs, e.g., through their legal means or access. The rule dimension is focused on the rules governing actors' interaction. Interaction rule is a type of formal procedure that determines how actors relate to one another. This dimension examines the rules governing which actors participate in government and how the responsibilities of these actors are divided.

9.3 Concept of Forest Management Unit Formation

When Law Number 5 concerning Basic Forestry Provisions was promulgated in 1967, the concept of an FMU had already existed. However, the mandate for establishing FMUs was only clearly defined in Law 41 of 1999 on Forestry, which included implementing regulations under the Law including GR 6 of 2007 (Hernowo & Ekawati, 2014).

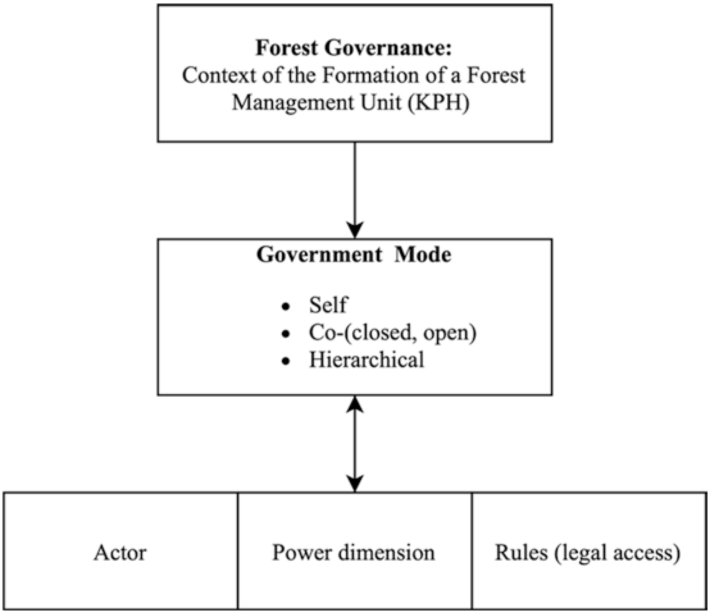


Fig. 9.3 Governance mode analysis scheme. (Based on Arnouts et al. (2012))

The FMU concept guides sustainable forest management over a given area based on the main function and design of the forest. Due to the territorial element of this concept, all state forest areas in Indonesia are anticipated to be divided into FMU areas (Maryudi, 2016).

FMUs are established for various rational reasons. First, the government refers to areas of deforestation and degradation. Nearly 55.93 million hectares (46.5%) of the 120.3 million hectares of total state forest land are not managed intensively (Kartodihardjo et al., 2011). Among these areas, local governments control 30 million hectares of forest. Without forest management and conflict resolution, a number of incentives for natural forest conservation and forest and land rehabilitation will be lost (Hernowo & Ekawati, 2014). The lack of forestry development institutions is due to limited local government capacity (Setyarso et al., 2014). This is also related to the fragility of central-regional ties (Julijanti et al., 2014; Purnomo, 2014).

FMU management begins with the development of a long-term FMU strategy. The plan is then coordinated with the central government, provincial government, and district government. Other stakeholders, such as government agencies, permit holders (if any), forest communities, nongovernmental organizations (NGOs), and academics, should be involved in the preparation of the work plan (Kartodihardjo et al., 2011). That is, the existing concept indicates an open governance model in the work plan activities. FMUs can conceptually collaborate with communities that receive permits, in which FMUs would be tasked with clearly and carefully identifying community needs over the benefits of forest resources (Kartodihardjo et al., 2011). Following the passing of the Omnibus Law, the FMU concept is incorporated

in GR 23 of 2021[2] concerning Forestry Implementation and Ministry of Forestry (MoFor) Regulation 8 of 2021 on Environment and Forestry.

9.4 Changes in the Role of FMUs After the Omnibus Law

Many FMU scholars and practitioners believe that the current regulations are far from fulfilling the intended FMU concept. Various issues regarding changes in the authority of FMUs include, first and foremost, the duties and functions of FMUs as facilitators of forest management at the site level in accordance with Article 123.[3] This role calls into question the ability of FMUs to continue playing a strategic role in ensuring sustainable resource management. Second, the current regulation limits forest uses for Forest Utilization Permits only (*Perizinan Berusaha Pemanfaatan Hutan* or PBPH) or social forestry management (*Pengelolaan Perhutanan Sosial*) with the approval of the Minister. The FMU is not registered as a party capable of utilizing the forest. Third, FMUs are no longer authorized to carry out forest utilization business activities, either jointly with partners in a business permit scheme or through forestry partnerships, as referred to in Article 244.[4] As a result, the original target for transforming FMUs as a Regional Public Service Agency (*Badan Layanan Umum Daerah* or BLUD) becomes obsolete.

We observed that there is no significant shift in authority over FMUs. Indeed, the growing narrative about FMUs is that they are currently fulfilling only an administrative task, as defined as a facilitator in Article 123. However, closer examination of the current regulations reveals that FMUs remain the organization responsible for implementing the forest management provisions of Article 40[5] (see Table 9.1). It shows the FMU's autonomy and professionalism as a knowledge-based institution. However, the central government's framing mainly focuses on the role of FMUs in article 123, despite the existence of articles 39 and 40. FMUs were initially designed to be autonomous and not tied to the central government bureaucracy. Article 119 confirms and follows Article 40, which requires FMUs to develop long-term forest management plans based on forest research, not rules. For example, forest planning activities, forest organization, forest activity execution, and forest control and supervision are all examples of forest activities.

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[2] GR 23 of 2021 has revoked and replaced GR 6 of 2007.

[3] According to Article 123 of GR 23 of 2021, the FMU organization is tasked with the responsibility of facilitating the implementation of policies across the forestry sector. Previously enacted government regulations did not have a facilitator role.

[4] Forest utilization activities are carried out under the Forestry Partnership scheme in accordance with an agreement between the management holder and a State-Owned Enterprise or a Forest Utilization Permit with the local community.

[5] According to Article 40 of GR 23 of 2021, the FMU organization is responsible for forest management implementation, including management planning, organization, implementation, control, and monitoring.

Table 9.1 Authority of FMUs by regulation

GR 6 of 2007	Law 23 of 2014	GR 23 of 2021
1. Implement forest management 2. Elaborate national, provincial, and district/city forestry policies in the forestry sector to be implemented 3. Implement forest management activities in their territory, starting from planning, organizing, implementing, monitoring, and controlling 4. Carry out monitoring and assessment of the implementation of forest management activities in their areas 5. Create investment opportunities to support the achievement of forest management objectives	1. Forest inventory management 2. Implementation of forest area gazettement 3. Implementation of forest area management 4. Implementation of the establishment of forest management areas 5. Implementation of the establishment of forest management areas 6. Implementation of the establishment of forest management areas 7. Implementation of the national forestry plan 8. Forest management 9. Implementation of forest management plans 10. Implementation of forest use and use of forest areas 11. Forest rehabilitation and reclamation 12. Implementation of forest protection 13. Forest product processing and administration ⇩ 14. Implemented by FMUs as a facilitating role on the basis of central government orders	1. Strengthening of the national forest management system and provincial government (Article 39) 2. Responsibility for the implementation of forest management (Article 40) 3. Preparation of long-term and short-term forest management plans (Article 119) 4. Coordination of forest management planning with business permit holders, holders of approvals for the use and release of forest areas, and managers of social forestry (Article 123) 5. Facilitation of policy implementation in the fields of environment and forestry (Article 123) 6. Facilitation in supporting social forestry (Article 123)

We interpret Article 123 as stipulating FMUs to act as a facilitating role, which establishes a directive from the central government to the FMUs, particularly given the division of power stated in Law 23 of 2014 concerning Regional Governance. This is clearly shown in Table 9.1 as it says that the central government is the organizer of sub-planning efforts concerning forests and forest management in the government affairs section. Accordingly, the FMU is tasked with an assisting role (*tugas pembantuan*). The role of FMUs following the Omnibus Law, in our opinion, has not changed significantly from GR 6 of 2007. According to Article 9 of GR 6 of 2007, FMUs have the same duties and functions as FMUs based on GR 23 of 2021 when it relates to forest management. Article 123 only provides additional tasks to FMUs that are co-administered. Currently, the central government frames them based on Article 123 only, even though FMUs are also defined in Articles 39 and 40.

9.5 Actors in Forest Governance

The perspective of actors who have significant authority in forest management can be seen from local FMU operations. In Yogyakarta Province, state forest governance is overseen by key actors, which are the Provincial and District Offices. Gunung Kidul District, however, manages community forests within its boundaries and has done so for a long time. The success of the social forestry program through the Community Forest designation (*Hutan Kemasyarakatan* or HKm) is the result of the district government's commitment to fostering and facilitating the establishment and support of forest farmer groups. However, since the enactment of Law 23 of 2014, the configuration of actors has shifted. This is because the forestry sector is now exclusively managed by the central and provincial governments. The implication is that the District Forestry Agency's role has been abolished and all authority is handed over to the province. In an interview with the former head of the District Forestry Agency of Gunung Kidul, we were told:

> The impacts of the issuance of Law 23 of 2014 are that the District Forestry Agency of Gunung Kidul – which provided assistance to community forests, forest parks, and farmer groups – were dissolved, and all of its authority was delegated to the Provincial Forestry Agency. The delegation of affairs and authority was only carried out in 2017 where FMU and the District Forestry Agency of Yogyakarta received around 80 structural and functional employees.

Since its establishment in 2011, FMUs have grown to become an important player in state forest management in the Yogyakarta region. Although the regional technical implementation unit (*Unit Pelaksana Teknis Daerah* or UPTD) is under the Provincial Forestry Agency, the existence of FMUs is important because they also function as a substitute for the Agency. FMUs have emerged as a new actor in local forest governance in collaboration with the Provincial Forestry Agency. However, the position and role of the FMUs are again being questioned due to the Omnibus Law. Their responsibility for the territories they manage through forest management is not clear in GR 23 of 2021, nor are they yet to be explained in subsequent implementing regulations. For example, in Article 127, it is stated that forest utilization activities are carried out by Forest Utilization Permits and/or the management of social forestry, not by FMUs. Forest Utilization Permits and Social Forestry Management are the responsibility of the Minister of Environment and Forestry who acts as the licensor. While each Forest Utilization Permit holder is required to prepare a work plan in accordance with the FMU Long-Term Management Plan (*Rencana Pengelolaan Jangka Panjang* or RPJP), we see that the authority of FMUs in their own areas is being questioned due to these other mandates. Meanwhile, many scholars continue to argue that FMUs should be encouraged to develop into independent business units that have creative space in forest utilization activities because they would be managed by individuals with site-specific expertise (Kartodihardjo et al., 2011; Maryudi, 2016; Pratama et al., 2021). FMUs are no longer authorized to conduct business activities with partners within a forestry

partnership scheme. Social forestry managers can carry out utilization activities independently or in collaboration with other actors, but not with FMUs.

In comparison to FMUs, nongovernment actors that obtain Forest Utilization Permits or social forestry managing entities have a role in forest utilization under current regulations. According to article 40, FMUs should be a unit that ensures the implementation of governance in its jurisdiction. Furthermore, as mentioned in Article 123, all forest management activities must be coordinated with an FMU. As a result, the function of FMU in forest governance must be reviewed, as it has remained unchanged in comparison to prior regulations.

9.6 Dimensions of Power

Risks of perverse incentives have remained in place although seemingly numerous regulatory changes have taken place. For instance, since the issuance of permits was taken back by the authority of the Ministry of Environment and Forestry, the governing authorities at the subnational level markedly diminished. Without licensing powers, provincial forestry agencies that host FMUs may be disinterested in engaging with the additional bureaucratic burden.

FMUs can be viewed as the central government's effort to secure state forests across Indonesia. FMUs must be seen in the context of power as a component of power relations that cannot be separated from the control of the central government, regardless of regional status. According to Sahide et al. (2016), the real struggle of FMUs and community forestry policies indicate a power struggle among the national, provincial, and district bureaucracies. The history of centralized forest governance in Indonesia has impacted the demand for decentralization of forest policy. However, when regions gained autonomy, several strategies were implemented to restrict decentralization of forest resource management, thus maintaining central control.

Currently, the overall authority of FMUs is being questioned and challenged once again, particularly regarding forest governance at the site level. FMUs, which recognize their institutional role as a facilitator, are under the control of the central government through co-administration arrangements. FMUs do not mobilize forest resources because forest use is delegated to nongovernment actors who are granted permits. On the one hand, regulatory tools show that FMUs are hierarchical in nature because they carry out forest management tasks assigned by the central government but are responsible for autonomous forest management at other times. FMUs are directly responsible to the central government. The responsibilities assigned to FMUs are also unclear as there are nongovernmental actors who are able to directly utilize the forest without the assistance of FMUs. Overall, this points to the undermining and marginalization of the role and mandate of the FMU.

We find that current government efforts to reintroduce rules-based forest governance are undertaken by providing forest use permit holders with management permit instruments. Meanwhile, market-based governance is implemented through

business licenses managed by actors such as individuals, cooperatives, State-Owned Enterprises (*Badan Usaha Milik Negara* or BUMN), Regional-Owned Enterprises (*Badan Usaha Milik Daerah* or BUMD), and Private-Owned Enterprises. The observed model of governance is still dominated by government actors through the formation of a hierarchical bureaucratic system. FMUs thus cannot be discussed separately from central government control. FMUs do not appear to be autonomous organizations with territorial responsibilities and jurisdiction. Collaboration in governance is demonstrated by the presence of nongovernment actors such as community groups and private actors. However, we find that horizontal governance by collaborative cooperation has not yet occurred. The actors gain access to permit-based management in accordance with the Minister's standards and guidelines for sustainable forest management.

9.7 Conclusion

Market-based regulations and governance modes have failed to improve forest conditions and have resulted in widespread deforestation in Indonesia. FMUs, established in 2007, aimed at reshaping the governance landscape. In this chapter, FMUs provided an avenue for synthesizing the failures of forest governance over time. Designed to be an autonomous, science-based organization, FMUs have been undermined by their unclear authority and standing.

As of now, the role of FMUs under GR 23 of 2021 is still open to interpretation. Consequently, there are some FMUs that continue to carve out the semblance of their intended functionality. More broadly, however, the framing as a facilitator that emerged from the forestry ministry was undermined through the tight control that the central government redefined for itself. In addition, nongovernment actors, such as social forestry community groups and Forest Utilization Permits, play a growing role in forest management and bypass FMUs because they are only legally responsible to the Minister.

We conclude that forest governance continues to be based on permit-based forest use management, with nongovernmental actors that have expanded to include community as well as private actors. The involvement of nongovernment actors has not demonstrated an open governance model, to which FMUs were envisioned to facilitate. This is because collaboration is still bound by rigid and nonautonomous regulatory dimensions so that a horizontal form of government does not materialize. It also shows how the current governance structure operates, which is hierarchical and governed by top-down mandates and relationships. To achieve the envisioned reforms of establishing FMUs, governance cannot be solely based on rules and markets in the future. Instead, it must be balanced with science-based governance, in which FMUs would play a critical role.

Eventually, the power balance between FMUs and Forestry Agency authority may be rectified. Doing so would require providing FMUs with sufficient creative space to develop long-term and short-term plans through complementary

relationships with the Forestry Agency. Accordingly, FMUs should be encouraged to develop into autonomous institutions that also serve local interests.

References

Arnouts, R., van der Zouwen, M., & Arts, B. (2012). Analysing governance modes and shifts – Governance arrangements in Dutch nature policy. *Forest Policy and Economics, 16*, 43–50. https://doi.org/10.1016/j.forpol.2011.04.001

Awang, S. A. (2003). *Politik Kehutanan Masyarakat*. Center for Critical Social Studies (CCSS).

Barr, C., Resosudarmo, I. A. P., Dermawan, A., & Mccarthy, J. (2006). Forests and decentralization in Indonesia: An overview. In C. Barr, I. A. P. Resosudarmo, A. Dermawan, & J. Mccarthy (Eds.), *Decentralization of forest administration in Indonesia: Implications for forest sustainability, economic development and community livelihoods*. Center for International Forestry Research (CIFOR).

FAO, & JRC. (2012). *Global forest land-use change 1990–2005* (FAO forestry paper no. 169). Food and Agriculture Organization of the United Nations and European Commission Joint Research Centre.

FWI/GFW. (2001). *Keadaan hutan Indonesia*. Forest Watch Indonesia, and Global Forest Watch.

Hernowo, & Ekawati, S. (2014). *Operasionalisasi kesatuan pengelolaan Hutan (KPH): Langkah awal menuju kemandirian* (B. Hernowo, & S. Ekawati, Eds.). PT Kanisius.

Julijanti, Nugroho, B., Kartodihardjo, H., & Nurrochmat, D. R. (2014). Policy adoption of forest management unit: A knowledge diffusion analysis. *Jurnal Manajemen Hutan Tropika, 20*(2), 94–102. https://doi.org/10.7226/jtfm.20.2.94

Kartodihardjo, H., Nugroho, B., & Putro, H. R. (2011). *Forest management unit development (FMU) Concept, legislation and implementation* (A. Djajono, & L. Siswanty, Eds.). Directorate of Area Management and Preparation of Forest Area Utilisation.

Kooiman, J. (2003). *Governing as governance*. SAGE.

Lange, P., Driessen, P. P. J., Sauer, A., Bornemann, B., & Burger, P. (2013). Governing towards sustainability-conceptualizing modes of governance. *Journal of Environmental Policy and Planning, 15*(3), 403–425. https://doi.org/10.1080/1523908X.2013.769414

Larson, A. M., Mausch, K., Bourne, M., Luttrell, C., Schoneveld, G., Cronkleton, P., Locatelli, B., Catacutan, D., Cerutti, P., Chomba, S., Djoudi, H., Ihalainen, M., Lawry, S., Minang, P., Monterroso, I., Myers, R., Naito, D., Pham, T. T., Reed, J., et al. (2021). Hot topics in governance for forests and trees: Towards a (just) transformative research agenda. *Forest Policy and Economics, 131*, 102567. https://doi.org/10.1016/j.forpol.2021.102567

Maryudi, A. (2016). Arahan tata hubungan kelembagaan kesatuan pengelolaan hutan (KPH) di Indonesia. *Jurnal Ilmu Kehutanan, 10*(1). https://doi.org/10.22146/jik.12632

Maryudi, A., Nurrochmat, D. R., & Giessen, L. (2018). Research trend: Forest policy and governance – Future analyses in multiple social science disciplines. *Forest Policy and Economics, 91*(January), 1–4. https://doi.org/10.1016/j.forpol.2018.02.007

Ministry of Forestry, D. J. P. K. (2012). *Peraturan terkait Kesatuan Pengelolaan Hutan (KPH)*. Direktorat Wilayah Pengelolaan dan Penyiapan Areal Pemanfaatan Kawasan Hutan Direktorat Jenderal Planologi Kehutanan.

Moeliono, M., Wollenberg, E., & Limberg, G. (2008). *The decentralization of forest governance: Politics, economics and the fight for control of forest in Indonesia Borneo*. Earthscan Publications.

Peluso, N. L. (2007). Violence, decentralization, and resource access in Indonesia. *Peace Review, 19*(1), 23–32. https://doi.org/10.1080/10402650601181840

Pratama, A. A. (2019). Lessons learned from social forestry Policy in Java forest: Shaping the way forward for new forest status in ex-Perhutani forest area. *Jurnal Ilmu Kehutanan, 13*(2), 127. https://doi.org/10.22146/jik.52092

Pratama, A. A., Laraswati, D., Soraya, E., Arfenda, C. F., Kurniawan, H., Rahayu, S., Widyaningsih, T. S., & Harsono, P. (2021). *Semburat cahaya istimewa: Inovasi dan kreasi pengelolaan hutan KPH Yogyakarta* (A. Nurjaman, A. A. Nawir, & A. Maryudi, Eds.) Fakultas Kehutanan Universitas Gadjah Mada.

Purnomo, E. P. (2014). *Strengthening local institutions in the context of shifting policies*. Thesis School of Social and International Studies, University of Bradford.

Putro, W. D., & Nawir, A. A. (2018). *Kelola hutan di rezim semi sentralisasi*. Paper knowledge. Toward a media history of documents (F. Tolomundu, Ed.) Polydoor Printika.

Rahman, M. S., Sarker, P. K., Sadath, M. N., & Giessen, L. (2018). Policy changes resulting in power changes? Quantitative evidence from 25 years of forest policy development in Bangladesh. *Land Use Policy, 70*(November), 419–431. https://doi.org/10.1016/j.landusepol.2017.11.029

Resosudarmo, I. A. P. (2004). Closer to people and trees: Will decentralisation work for the people and the forests of Indonesia? *European Journal of Development Research, 16*(1), 110–132. https://doi.org/10.1080/09578810410001688761

Sahide, M. A. K., Supratman, S., Maryudi, A., Kim, Y. S., & Giessen, L. (2016). Decentralisation policy as recentralisation strategy: Forest management units and community forestry in Indonesia. *International Forestry Review, 18*(1), 78–95. https://doi.org/10.1505/146554816818206168

Setyarso, A., Djajono, A., Nugroho, B., Wulandari, C., Suwarno, E., Kartodihardjo, H., & Sardjono, M. A. (2014). *Strategi pengembangan KPH dan perubahan struktur kehutanan Indonesia*. *E-Book* Direktorat wilayah pengelolaan dan penyiapan areal pemanfaatan kawasan hutan, Direktorat jenderal planologi kehutanan.

Soedomo, S. (2017). Failure of forestry political economy of Indonesia. *Jurnal Manajemen Hutan Tropika, 23*(2), 111–118. https://doi.org/10.7226/jtfm.23.2.111

Sunderline, W., & Resosudarmo, I. A. P. (1996). *Rates and causes of deforestation in Indonesia: Towards a resolution of the ambiguities*. Centre for International Forestry Research (CIFOR).

Tacconi, L., Rodrigues, R. J., & Maryudi, A. (2019). Law enforcement and deforestation: Lessons for Indonesia from Brazil. *Forest Policy and Economics, 108*(June), 101943. https://doi.org/10.1016/j.forpol.2019.05.029

World Bank. (1997). *World development report 1997: The State in a changing world. Foreign policy*. The World Bank Oxford University Press.

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Chapter 10
Biofuels Development and Indirect Deforestation

Rizky Ramadhan, Akihisa Mori, and Oekan S. Abdoellah

Abstract The Indonesian government launched the B30 program (a mixture of 30% biodiesel and 70% diesel fuel) in 2019 to save foreign exchange, reduce dependence on fossil fuels, and improve environmental quality. Indonesia uses palm oil as the main source for making biodiesel, as proven by an increase in the domestic market demand for biodiesel by as much as 2.69 million tons. This is followed by the increase of the area of palm oil plantations by 4.25 million hectares from 2014 to 2020. In contrast, the rate of deforestation in the three main palm oil-producing islands (Sumatra, Kalimantan, and Papua) tends to decline. These facts raise a hypothesis that the B30 program may trigger indirect deforestation or conversion of nonforest areas to palm oil. To prove this hypothesis, we use the geographic information system (GIS) to detect and analyze land cover by looking at historical data on land-use changes in the Province of Riau and Central Kalimantan, the largest palm oil-producing provinces. The development of biofuels under the moratorium regulation indirectly encourages oil palm companies to open oil palm plantations in areas originally used as cultivation areas. The loss of land for cultivation has encouraged local communities to clear land for cultivation in the forest. This situation is what we call indirect deforestation.

Keywords KCP · Governance · Representation · Palm oil · ISPO · Indonesia

10.1 Introduction

Indonesia's government committed to reducing GHG emissions by 29% from Business as Usual (BAU) by 2030. For this purpose, starting in 2020, the Government of Indonesia issued a mandatory program of biodiesel called B30 (a mixture of 30%

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biodiesel and 70% diesel fuel), making Indonesia the highest implementer of biodiesel in the world. This program claimed to benefit the state by adding foreign exchange of $ 3.4 billion.

As palm oil is a raw material for biodiesel, this program can contribute positively to the regional economy by alleviating rural poverty and promoting local infrastructure development (Janda et al., 2012; Pacheco et al., 2017). On the other hand, the development of oil palm plantations is often associated with deforestation and causes the loss of biodiversity and exacerbates climate change that has already occurred (Cazzolla Gatti & Velichevskaya, 2020; Miettinen et al., 2014; Oon et al., 2019; Vijay et al., 2016).

An increasing number of domestic markets demand for biodiesel by as much as 2.69 million tons, followed by the increase in the area of palm oil plantations by 4.25 million hectares from 2014 to 2020. In contrast, the rate of deforestation in the three main palm oil-producing islands (Sumatra, Kalimantan, and Papua) tends to decline. The government, through the Ministry of Environment and Forestry, prohibits the clearing of oil palm in conservation of forest areas but allows the clearing of oil palm land in other use land (APL) or nonforest areas through Law No. 41 of 1999. This indicates that the government is trying to reduce deforestation in Indonesia. However, the conversion of other land uses to palm oil will cause deforestation through the process of indirect deforestation.

Several studies show that indirect deforestation occurs in the development of soybean commodities (Gollnow et al., 2018; Lima et al., 2011; Song et al., 2021). Studies on indirect deforestation in oil palm development are still limited. However, a study by Ramadhan et al. (2021) shows that on a small scale, indirect deforestation has occurred in the Dusun Tonggong, Parindu, West Kalimantan, Indonesia, due to the development of oil palm commodities in the area. The previous research regarding indirect deforestation in the context of oil palm development has a limited scope of the study, so this chapter tries to see if something similar is happening in the level of provinces in Indonesia, particularly the provinces of Riau and Central Kalimantan. We use a Geographic Information System (GIS) to detect and analyze indirect deforestation by looking at historical data on land-use changes.

10.2 Biofuel Policy

10.2.1 Mandatory Blending Rates of Biodiesel in Indonesia

In 2006, through Presidential Decree No. 5/2006, the Indonesian government made the Ministry of Energy and Mineral Resources the legal body to create the National Energy Management Blueprint. One of the targets is to increase biofuel utilization (higher than 5%). In this year, biodiesel was also used for the first time through the Directorate General of Oil and Gas Decree No. 3675 K/24/DJM/2006 with a maximum limit of 10% FAME (Fatty, Acid, Methyl, and Ester) content.

Although in 2006 biofuels were used, the government, for the first time, issued a mandatory to use biodiesel in 2008, through the Ministry of Energy and Mineral Resources Decree No. 32/2008. At this time, the government only allowed the use of B2.5–B.7.5 (a mixture of 2.5% to 7.5% biodiesel to diesel fuel). In 2010, the government established the Directorate General of Renewable Energy and Energy Conservation. One of its directorates is the Directorate of Bioenergy, which handles biodiesel. This Directorate plays an essential role in developing biofuels policy, including the improvement of regulations related to mandatory and biodiesel specifications. This B2.5–B7.5 program lasted until 2013.

The B2.5–B7.5 program in 2014 was followed by B10, which was later increased to B15 in 2015. In 2015, the Ministry of Energy and Mineral Resources Decree No. 12/2015 replaced the Ministry of Energy and Mineral Resources Decree No. 32/2008. This regulation has currently become the reference for implementing mandatory biodiesel in Indonesia.

The B20 mandate, implemented in 2016, is a new history, especially for Indonesia, where Indonesia is the first country to implement B20. Even though it is considered successful in the transportation sector, this mandatory B20 program has not been followed by other sectors. Some of the obstacles faced are price, availability, and distribution, which are still limited. To expand the use of B20 in all sectors, the government issued Presidential Decree No. 66/2018 and implemented it in September 2018. This Presidential Decree succeeded in reducing diesel imports in September by 379,400 tons (see Fig. 10.2). Despite the increase in the following months after the implementation of Presidential Decree No. 66/2018, overall, this program succeeded in reducing diesel imports by 466,902 KL (Public Relation Directorate General of New and Renewable Energies and Energy Conservation, 2019) (see Fig. 10.1).

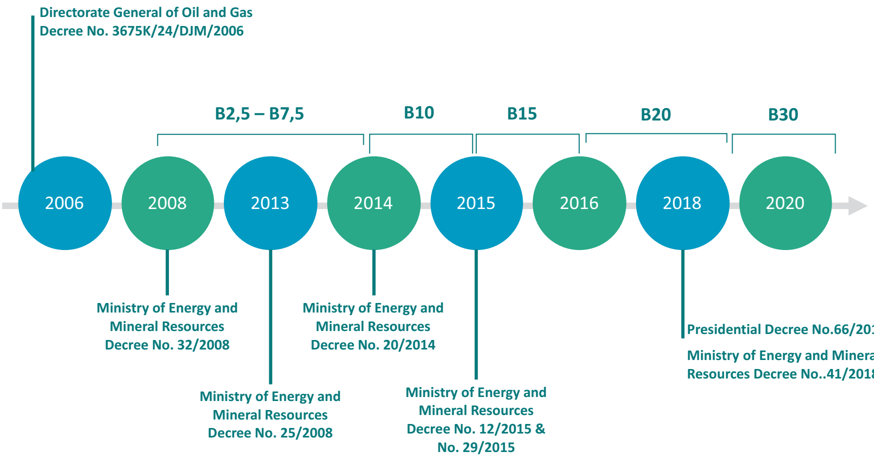


Fig. 10.1 Progressive blending rates in biodiesel policy and implementation in Indonesia. (Source: Ministry of Energy and Mineral Resources, 2021)

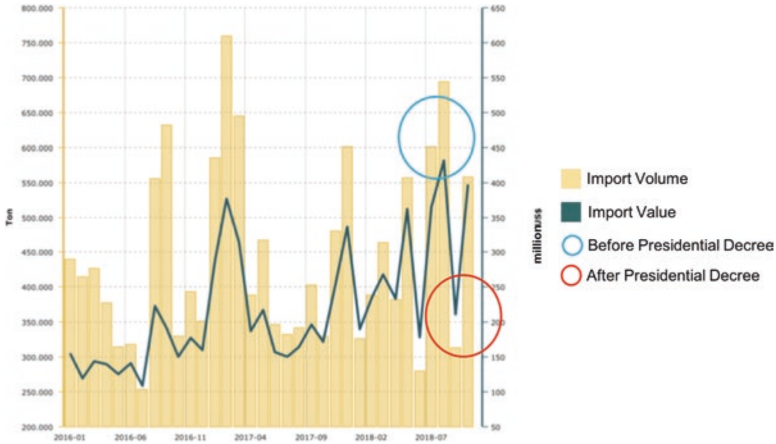


Fig. 10.2 Imported Indonesian diesel after the presidential decree (66/2018). (Source: "*Impor Solar Oktober*," 2018)

The government of Indonesia implemented the mandatory program B30 on January 1, 2020. Until now, this program has been running for more than one and a half years. This program is considered successful. The B30 program up to semester one has saved Indonesia's foreign exchange of 1.7 billion USD.

10.2.2 Environmental Impacts on Biofuels Program

The biofuels program in Indonesia is considered to be acceptable by the public because since 2016 the government has guaranteed through incentives that the price of biofuel is not higher than the price of fuel. This has been proven to increase biofuel sales (Wiratmini, 2019). Data in 2019 shows that domestic demand for biofuels in Indonesia has increased by 2.22 million tons (see Table 10.1). The development of this demand is in line with the increase in palm oil plantation area. Based on the Directorate General of Estate data, there was an increase in the area of palm oil plantations by 0.39 million hectares in 2019 (see Fig. 10.3).

Indonesia uses palm oil as the primary source of biodiesel production. Several parties in Indonesia debate it (Corley, 2009; Kamahara et al., 2010; Khatiwada et al., 2021; Oosterveer, 2020). The development of palm oil plantations is often associated with deforestation and causes the loss of biodiversity and exacerbates climate change that has already occurred.

In principle, the government of Indonesia and all palm oil stakeholders are against any illegal practices of palm oil stakeholders. For this reason, the government implemented a moratorium and Indonesian Sustainable Palm Oil (ISPO) certificate as a policy (Salman and Mori in this volume). Although the effectiveness of the palm oil development moratorium is still in question and becoming a debatable

Table 10.1 Biodiesel production and usages in Indonesia (recreated by the author based on data from Indonesia Biofuel Producers 2020

Year	Production (mill tons)	Domestic (mil tons)	Export (mil tons)	Domestic Growth (mil tons)	Blending rate
2014	3.32	1.55	1.37	0.67	B10
2015	1.39	0.77	0.28	−0.78	B10
2016	3.07	2.52	0.40	1.76	B10
2017	2.87	2.16	0.16	−0.37	B10
2018	5.17	3.15	1.51	0.99	B20
2019	7.04	5.36	1.11	2.22	B20
2020 E	8.47	8.05	0.42	2.69	B30

Source: Indonesian Biofuel Producers 2020, cited from Council of Palm Oil Producing Countries (2021)

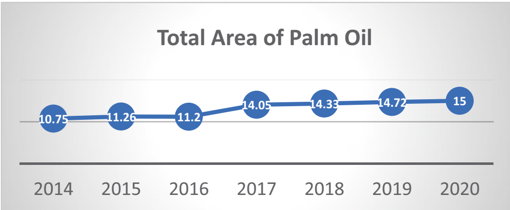


Fig. 10.3 Total area of palm oil plantation (recreated by the author based on data from Directorate General of Estate Crops). (Source: Directorate General of Estate Crops, 2019)

issue, this regulation affects the rate of deforestation in Indonesia (see Fig. 10.4). From this figure, the rate of deforestation declined, and the government claimed that the decline of the deforestation rate is due to the success of the implementation of the moratorium program (Austin et al., 2019). However, the other argument claims that the decline of the deforestation rate during the last 2 years is due to the La Nina years, wet conditions resulting in a less flammable landscape (Gaveau et al., 2022).

In addition, many mentioned that the potential massive deforestation is still there (Andrianto et al., 2019; Gaveau, 2018; The Gecko Project, 2018). This is particularly true in the Papua and West Papua provinces, where a million forestlands have been allocated or licensed to oil palm companies for the development of oil palm plantations in the future (Gaveau, 2018). Based on the data in Fig. 10.5, the deforestation rate in Papua provinces tends to increase, despite the existence of the moratorium (see Fig. 10.5).

10.2.3 Indirect Deforestation

Indirect deforestation occurs when one commodity in one location displaces the previous commodity to the frontier forest area (Rausch & Gibbs, 2016). Oil palm plantations can claim that their plantations are deforestation-free because they are

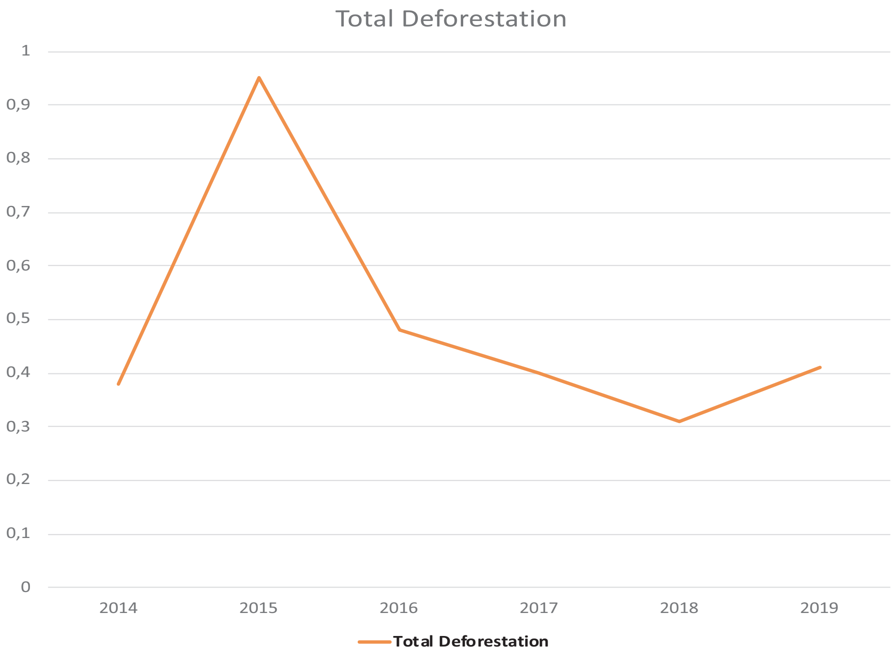


Fig. 10.4 Total deforestation in Indonesia. (Source: BPS, 2019)

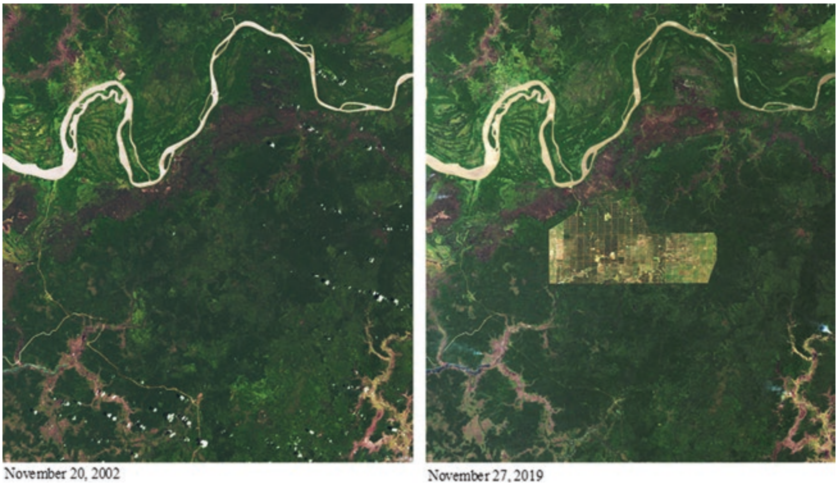


Fig. 10.5 Deforestation in Papua. (Source: NASA Earth Observatory, 2021)

built on nonforest lands such as vacant fields or land. Palm oil plantations may use land that the local people should use to cultivate their daily needs. It is not uncommon for the cultivation of biofuels to replace previous agricultural activities.

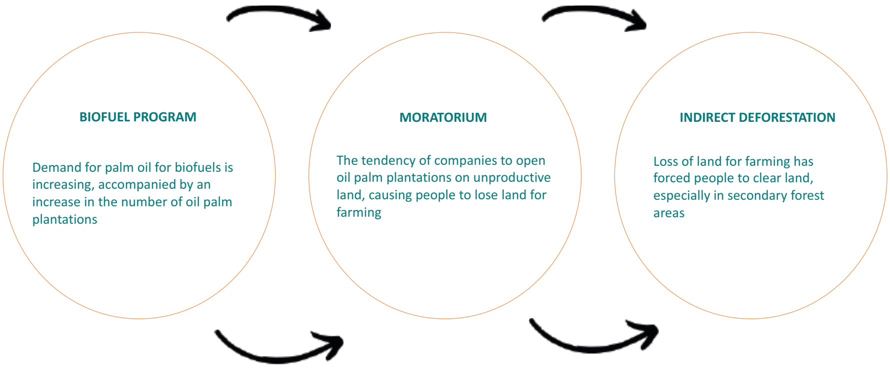


Fig. 10.6 Biofuel program and indirect deforestation

In this case, small-scale farmers who lack access to land and working capital are likely to relocate their cultivation areas to forest areas (Castiblanco et al., 2015; Jensen et al., 2019; Mukherjee & Sovacool, 2014; Saikkonen et al., 2014; Saswattecha et al., 2016; Silalertruksa & Gheewala, 2012). Indirect deforestation caused by displacement or loss of community farming land is difficult to prevent because people need new areas to maintain their livelihoods (Azhar et al., 2021).

Biofuel programs based on vegetable oil raised environmental impacts and indirect deforestation issues (see Fig. 10.6). When the demand for palm oil for biofuels is increasing, it is likely to be followed by an increase in the area of oil palm plantations.

10.3 GIS Analysis of Indirect Deforestation

10.3.1 Methodology

An understanding of indirect deforestation in the development of biofuels in Indonesia is needed to prevent unintended consequences from deforestation prevention policies. This information can help policymakers be more careful and provide a broader picture of deforestation prevention programs. The challenge of this issue is the difficulty in detecting or measuring indirect deforestation (Breetz, 2017; Jafari et al., 2017; Mukherjee & Sovacool, 2014). To overcome this, we use the geographic information system (GIS) to detect and analyze land cover by looking at historical data on land-use changes in Riau and Central Kalimantan as the largest palm oil producers. We examined 890,654 points for Central Kalimantan and 1,038,607 points for the Province of Riau, which was selected based on the image's clarity through satellite imagery.

Table 10.2 Area and palm oil production

Province	Total	
	Areal (Ha)	Production (Ton)
Riau	2.741.621	9.513.208
West Kalimantan	2.017.456	5.235.299
Central Kalimantan	1.922.083	7.664.841

Source: Statistical of National Leading Estate Crops Commodity, 2019–2021

10.3.2 Case Selection

Riau and Central Kalimantan provinces have great potential in developing biodiesel production. The largest area of palm oil plantation is in Riau Province, 2.7 million hectares in 2019, with a CPO production of 9.5 million tons. Central Kalimantan ranks third for the land area with 1.9 million hectares, but CPO production is the second largest after Riau Province, with 7.6 million tons (see Table 10.2). With this land area and total production, Riau and Central Kalimantan provinces have become the largest biodiesel suppliers in Indonesia.

The development of oil palm plantations as biodiesel raw material in the Riau and Central Kalimantan Province and the palm oil moratorium can make local people lose land for farming. People who lose their land tend to clear forests to establish farmland (Azhar et al., 2021). This tendency helps us identify indirect deforestation in Riau and Central Kalimantan Provinces.

10.4 Results

10.4.1 Indirect Deforestation in Riau (Fig. 10.7)

Based on calculations from GIS, the total change in forest area converted directly to oil palm from 1990 to 2020 is 1,502,192 ha, while the total area of forest opened by indirect deforestation activities is 277,126 ha (see Table 10.3). The data shows that 84% of forest cover loss in Riau from 1990 to 2020 was caused by direct deforestation activities from oil palm plantations, and only 16% caused by indirect deforestation (see Fig. 10.8).

10.4.2 Indirect Deforestation in Central Kalimantan (Fig. 10.9)

Based on the GIS calculation, the total area of forest open as a direct result of oil palm plantations in the Central Kalimantan region is 459.524 ha. In comparison, that caused by indirect deforestation is 384.596 ha (see Table 10.4). Also, 54% of

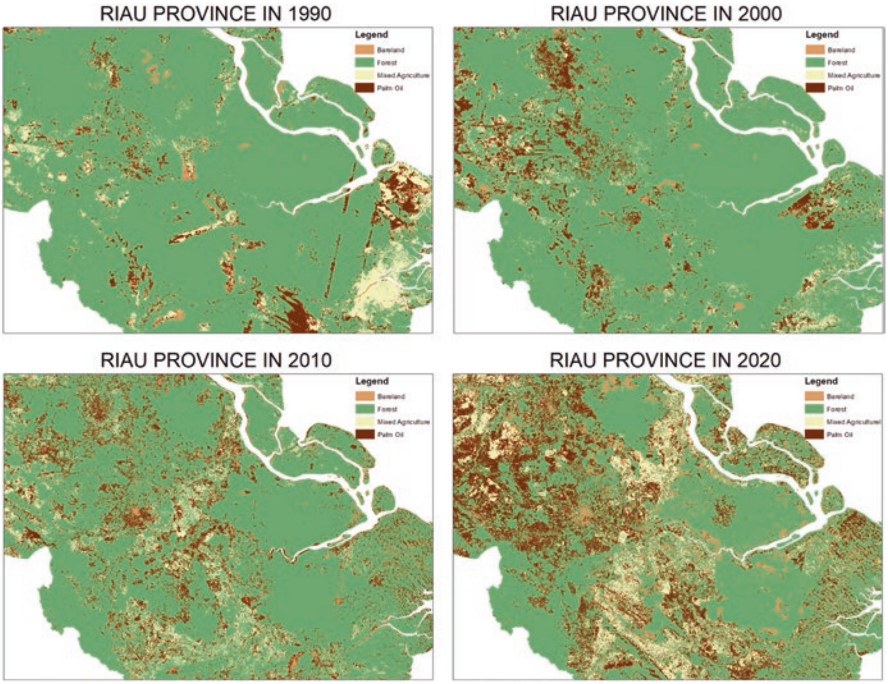


Fig. 10.7 Land use change in Riau (1990–2000). The picture shows that palm oil has existed in the Riau area since 1990. It has grown rapidly from 2010 to 2020. (Source: Data Processing from USGS satellite imagery)

Table 10.3 Total area by land-use change activity in Riau Province

Land use change	Area (Ha)
Direct by palm oil	1502192,747
Indirect deforestation	277126,6219
Total area	**1779319,369**

Source: Data Processing

land cover loss in Central Kalimantan is due to direct land conversion from forest to oil palm plantations, and 46% of forest cover loss in Central Kalimantan is caused by indirect deforestation (see Fig. 10.10).

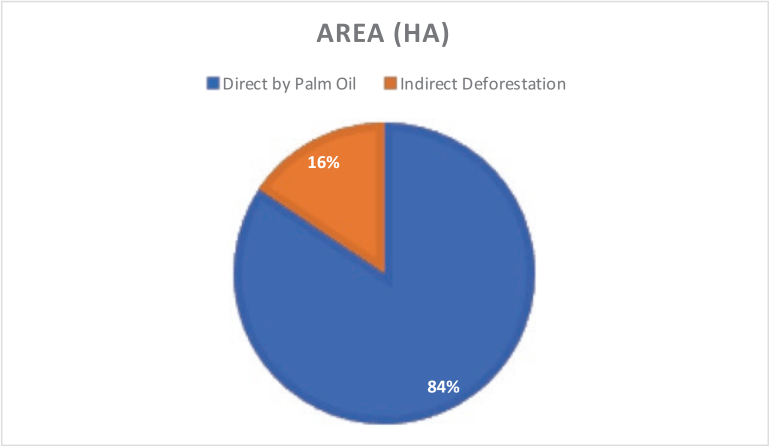


Fig. 10.8 Percentage of land-use change activity in Riau Province. (Source: Data Processing)

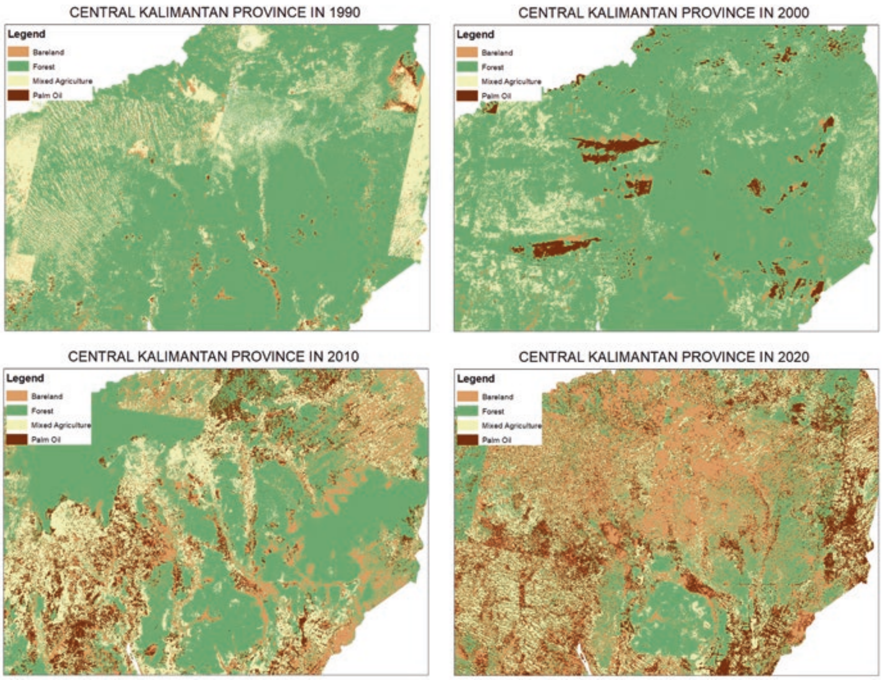


Fig. 10.9 Land-use change in Central Kalimantan (1990–2000). Same as in the Riau province, in Central Kalimantan, oil palm plantations have appeared since 1990, but their development has been very rapid from 2010 to 2020. (Source: Data Processing from USGS satellite imagery)

Table 10.4 Total area by land-use change activity in Central Kalimantan Province

Land use change	Area (Ha)
Direct by palm oil	459524.283
Indirect deforestation	384596.101
Total area	**844120.384**

Source: Data Processing

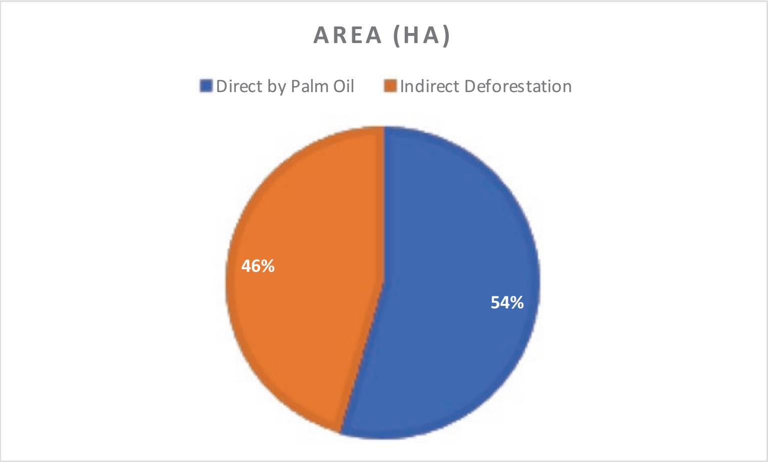


Fig. 10.10 Percentage of land-use change activity in Central Kalimantan Province. (Source: Data Processing)

10.5 Discussion

10.5.1 Palm Oil Moratorium and Indirect Deforestation in Riau and Central Kalimantan

The results of the GIS analysis show that indirect deforestation occurs in large forested provinces such as both Riau and Central Kalimantan provinces. In particular, for the Central Kalimantan Province, almost half the forest is open due to indirect deforestation. The palm oil moratorium is one of the triggers for indirect deforestation.

The palm oil moratorium is through Presidential Decree No. 8/2018 concerning postponement and evaluation of palm oil plantation permits and increasing productivity of palm oil plantation. This government regulation minimizes the opening of palm oil plantations in forest areas. Responding to the regulation, the company opened its palm oil plantations in nonforest areas. In most cases, the community generally uses the land for farming. Palm oil plantation development in nonforest

areas causes local communities to lose land for agriculture. The development of palm oil plantations in several areas triggers domestic migration and encourages local communities to give up their lands to immigrants (Pacheco et al., 2017).

Loss of land for agriculture due to palm oil plantation development in local community areas forced local people to open forest areas for cultivation. Palm oil expansion in nonforest areas triggers deforestation by local people in other areas (Feintrenie et al., 2010; Nelson et al., 2014; Ramadhan et al., 2021).

10.5.2 Indirect Deforestation and the Small-Scale Farmers

Small-scale farmers are also the driving factors for deforestation in Indonesia. Twenty-two percent of deforestation comes from activities carried out by small-scale farmers (Austin et al., 2019), which is almost the same as research conducted by Agus et al. (2013) and Gaveau et al. (2016). Small-scale farmers commonly employ slash-and-burn practices with shifting cultivation systems. They burn land to fertilize the soil and then use the land to cultivate the desired crop (Comte et al., 2012; van Vliet et al., 2013). This activity can usually only support a few years of production, after which the community will leave the land and move to another area. The increasing population and limited land due to competition with oil palm commodities have made the fallow time significantly shortened (Ramadhan et al., 2019). The shorter rotation pattern makes the soil lack nutrients. It affects the amount of production from the plants they grow, driving farmers to clear out further sections of forest (Azhar et al., 2021). Furthermore, to prevent the impact of slash-burn cultivation, the zero-burn technic can be used as an alternative. However, the use of zero-burning will decrease the profitability and increase the cost of local farmers (Sofiyuddin et al., 2021).

The development of oil palm in nonforest areas exerts indirect pressure on the forest areas elsewhere (Ramadhan et al., 2021). Community needs for sources of income and limited land due to competition with oil palm plantations for biofuels increase the possibility of indirect deforestation.

10.5.3 Integrated and Sustainable Environmental Governance for Forestry and Agriculture

An alternative would be developing the concept of communal palm oil plantations for the community. This method is considered essential to improve the community's welfare, especially for those who live in limitations such as rural areas (Baharuddin, 2012; Kumar et al., 2015). In order to prevent the "tragedy of the commons," as mentioned by Hardin (1968), an agreement regarding the rules for using resources is needed (Marten, 2001; see also Ostrom, 1990). Communal ownership is not a

new thing, especially in Indonesia. One example as mentioned by Mulyoutami et al. (2009), is the "*simpukng*" of the Dayak community in East Kalimantan. *Simpukng* is a secondary forest that is managed by the community, where its utilization is regulated by customary rules to avoid over-exploitation. The development of communal oil palm plantations gives communities access to equal production areas and prevents them from clearing forests in the future.

The development of biofuels using vegetable oil or what we often call first-generation biofuels, although economically it is cost-effective, has a relatively large environmental impact from an environmental point of view. The development of second (production of biofuel using waste) and third (development of biofuel using microalgae) generation can be an alternative to be developed so as to reduce the impact on the environment, although economically it is more expensive because it requires advanced technology (Naik et al., 2010; Sadatshojaei et al., 2020; Saladini et al., 2016).

10.6 Concluding Remarks

The development of biofuels under the moratorium regulation indirectly encourages oil palm companies to open oil palm plantations in areas originally used as cultivation areas. The development of oil palm in nonforest areas puts pressure on forest areas elsewhere. This is because people still need land to grow the crops they need for their daily needs.

The loss of land for cultivation due to the development of oil palm plantations for biofuels has encouraged local communities to clear land for cultivation in forest areas. The community does this to maintain their livelihoods. Indirect deforestation that occurs due to the loss of community-owned cultivation land is difficult to prevent.

Integrated and sustainable governance is needed, with an understanding of indirect deforestation, local plantation practices, and their role in the surrounding community. The development of secondary and third-generation biofuels can be an alternative to reduce the environmental impact caused by biofuels based on oil palm plantations. Another option is to develop communal palm oil plantations for the community. With communal ownership, it is expected that the benefits obtained could be distributed more evenly, providing security to the poor by converting individual risk into collective risk, increasing management capabilities, and facilitating each individual involved in business development (Ishak et al., 2020; Ortmann & King, 2007). In that condition, the community has a livelihood and prevents the clearing of land in forest areas.

We explored why the ISPO is underperforming and how the governance of ISPO has been improved. A case study is a relevant method for exploring "how" question and when the observation has no control over behavioral events (Yin, 2017). We used the establishment of the ISPO as a case study and treated the implementation

of ISPO regulation as a policy action resulting from KCP for governance (Table 10.1). We analyzed the Bappenas policy paper used for ISPO regulation as a form of coproduced knowledge using principles of successful sustainability research (Norström et al., 2020).

References

Agus, F., Gunarso, P., Sahardjo, B. H., Harris, N., van Noordwijk, M., & Killeen, T. J. (2013). Historical CO2 emissions from land use and land use change from the oil palm industry in Indonesia, Malaysia and Papua New Guinea. *Roundtable on Sustainable Palm Oil*. https://www.tropenbos.org/file.php/1344/5_historical_co2_emissions_agus_et_al.pdf

Andrianto, A., Komarudin, H., & Pacheco, P. (2019). Expansion of oil palm plantations in Indonesia's frontier: Problems of externalities and the future of local and indigenous communities. *Land, 8*(4), 56.

Austin, K. G., Schwantes, A., Gu, Y., & Kasibhatla, P. S. (2019). What causes deforestation in Indonesia? *Environmental Research Letters, 14*(2), 24007.

Azhar, B., Nobilly, F., Lechner, A. M., Tohiran, K. A., Maxwell, T. M. R., Zulkifli, R., Kamel, M. F., & Oon, A. (2021). Mitigating the risks of indirect land use change (ILUC) related deforestation from industrial palm oil expansion by sharing land access with displaced crop and cattle farmers. *Land Use Policy, 107*, 105498. https://doi.org/10.1016/j.landusepol.2021.105498

Baharuddin, A. H. (2012). Risk and poverty in agriculture: Expanding roles for agricultural cooperatives in Malaysia. *Geografia: Malaysian Journal of Society and Space, 8*(4), 1–11.

[BPS] Statistics Indonesia Badan Pusat Statistik. (2019). *Angka deforestasi netto Indonesia di dalam dan diluar kawasan hutan tahun 2013–2019* [Deforestation rate netto in Indonesia, inside and outside forest area 2013–2019]. https://www.bps.go.id/statictable/2019/11/25/2081/-angka-deforestasi-netto-indonesia-di-dalam-dan-di-luar-kawasan-hutan-tahun-2013-2019-ha-th-.html

Breetz, H. L. (2017). Regulating carbon emissions from indirect land use change (ILUC): U.S. and California case studies. *Environmental Science & Policy, 77*, 25–31. https://doi.org/10.1016/j.envsci.2017.07.016

Castiblanco, C., Etter, A., & Ramirez, A. (2015). Impacts of oil palm expansion in Colombia: What do socioeconomic indicators show? *Land Use Policy, 44*, 31–43. https://doi.org/10.1016/j.landusepol.2014.10.007

Cazzolla Gatti, R., & Velichevskaya, A. (2020). Certified "sustainable" palm oil took the place of endangered Bornean and Sumatran large mammals habitat and tropical forests in the last 30 years. *Science of the Total Environment, 742*, 140712. https://doi.org/10.1016/j.scitotenv.2020.140712

Comte, I., Davidson, R., Lucotte, M., de Carvalho, C. J. R., de Assis Oliveira, F., da Silva, B. P., & Rousseau, G. X. (2012). Physicochemical properties of soils in the Brazilian Amazon following fire-free land preparation and slash-and-burn practices. *Agriculture, Ecosystems & Environment, 156*, 108–115. https://doi.org/10.1016/j.agee.2012.05.004

Corley, R. H. V. (2009). How much palm oil do we need? *Environmental Science & Policy, 12*(2), 134–139. https://doi.org/10.1016/j.envsci.2008.10.011

Council of Palm Oil Producing Countries. (2021). *Palm oil supply and demand outlook report 2021*. https://www.cpopc.org/wp-content/uploads/2020/12/2021-PO-SUPPLY-AND-DEMAND-OUTLOOK-REPORT-1.pdf

Directorate General of Estate Crops. (2019). *Statistik Perkebunan Indonesia 2018–2020 : Kelapa Sawit* [Tree Crop Estate Statistics of Indonesia 2018–2020: Palm Oil]. https://drive.google.com/file/d/1FVxpBNihnuB3ayAALBi-FtsBShIUxMTD/view

Directorate General of Estate Crops. (2020). *Statistik Perkebunan Unggulan Nasional 2019–2021* [Statistical of National Leading Estate Crops Commodity 2019–2021]. https://drive.google.com/file/d/1ZpXeZogAQYfClNBOgVLhYi8X_vujJdHx/view

Feintrenie, L., Chong, W. K., & Levang, P. (2010). Why do farmers prefer oil palm? Lessons learnt from Bungo District, Indonesia. *Small-Scale Forestry, 9*(3), 379–396. https://doi.org/10.1007/s11842-010-9122-2

Gaveau, D. (2018). *Drivers of forest loss in Papua and West Papua*. Cifor. https://www.cifor.org/publications/pdf_files/factsheet/7444-factsheet.pdf

Gaveau, D. L. A., Locatelli, B., Salim, M. A., Husnayaen, Manurung, T., Descals, A., Angelsen, A., Meijaard, E., & Sheil, D. (2022). Slowing deforestation in Indonesia follows declining oil palm expansion and lower oil prices. *PLoS One, 17*(3), e0266178. https://doi.org/10.1371/journal.pone.0266178

Gaveau, D. L. A., Sheil, D., Husnayaen, Salim, M. A., Arjasakusuma, S., Ancrenaz, M., Pacheco, P., & Meijaard, E. (2016). Rapid conversions and avoided deforestation: Examining four decades of industrial plantation expansion in Borneo. *Scientific Reports, 6*(1), 32017. https://doi.org/10.1038/srep32017

Gollnow, F., de Hissa, L. B. V., Rufin, P., & Lakes, T. (2018). Property-level direct and indirect deforestation for soybean production in the Amazon region of Mato Grosso, Brazil. *Land Use Policy, 78*, 377–385. https://doi.org/10.1016/j.landusepol.2018.07.010

Hardin, G. (1968). The tragedy of the commons. *Science, 162*(3859), 1243–1248. http://www.jstor.org/stable/1724745

Impor Solar Oktober 2018 Melonjak 78% [Solar imports in October 2018 jumped 78%]. (2018, November 19). Katadata. https://databoks.katadata.co.id/-datapublish/2018/11/19/impor-solar-oktober-2018-melonjak-78

Ishak, S., Omar, A. R. C., Sum, S. M., Othman, A. S., & Jaafar, J. (2020). Smallholder agriculture cooperatives' performance: What is in the minds of management? *Journal of Co-Operative Organization and Management, 8*(2), 100110. https://doi.org/10.1016/j.jcom.2020.100110

Jafari, Y., Othman, J., Witzke, P., & Jusoh, S. (2017). Risks and opportunities from key importers pushing for sustainability: The case of Indonesian palm oil. *Agricultural and Food Economics, 5*(1), 0–16. https://doi.org/10.1186/s40100-017-0083-z

Janda, K., Kristoufek, L., & Zilberman, D. (2012). Biofuels: Policies and impacts. *Agricultural Economics, 58*(8), 372–386. https://doi.org/10.17221/124/2011-agricecon

Jensen, H. T., Keogh-Brown, M. R., Shankar, B., Aekplakorn, W., Basu, S., Cuevas, S., Dangour, A. D., Gheewala, S. H., Green, R., Joy, E. J. M., Rojroongwasinkul, N., Thaiprasert, N., & Smith, R. D. (2019). Palm oil and dietary change: Application of an integrated macroeconomic, environmental, demographic, and health modelling framework for Thailand. *Food Policy, 83*, 92–103. https://doi.org/10.1016/j.foodpol.2018.12.003

Kamahara, H., Hasanudin, U., Widiyanto, A., Tachibana, R., Atsuta, Y., Goto, N., Daimon, H., & Fujie, K. (2010). Improvement potential for net energy balance of biodiesel derived from palm oil: A case study from Indonesian practice. *Biomass and Bioenergy, 34*(12), 1818–1824. https://doi.org/10.1016/j.biombioe.2010.07.014

Khatiwada, D., Palmén, C., & Silveira, S. (2021). Evaluating the palm oil demand in Indonesia: Production trends, yields, and emerging issues. *Biofuels, 12*(2), 135–147. https://doi.org/10.1080/17597269.2018.1461520

Kumar, V., Wankhede, K. G., & Gena, H. C. (2015). Role of cooperatives in improving livelihood of farmers on sustainable basis. *American Journal of Educational Research, 3*(10), 1258–1266. https://doi.org/10.12691/education-3-10-8

Lima, M., Skutsch, M., & de Medeiros Costa, G. (2011). Deforestation and the social impacts of soy for biodiesel. *Ecology and Society, 16*(4). http://www.jstor.org/stable/26268958

Marten, G. G. (2001). *Human ecology: Basic concepts for sustainable development*. Earthscan.

Miettinen, J., Stibig, H.-J., & Achard, F. (2014). Remote sensing of forest degradation in Southeast Asia—Aiming for a regional view through 5–30 m satellite data. *Global Ecology and Conservation, 2*, 24–36. https://doi.org/10.1016/j.gecco.2014.07.007

Ministry of Energy and Mineral Resources. (2021). *Biodiesel, Jejak Panjang Sebuah Perjalanan* [Biodiesel, a long trail of a journey]. https://www.esdm.go.id/assets/media/content/content-buku-biodiesel-jejak-panjang-perjuangan-.pdf

Mukherjee, I., & Sovacool, B. K. (2014). Palm oil-based biofuels and sustainability in Southeast Asia: A review of Indonesia, Malaysia, and Thailand. *Renewable and Sustainable Energy Reviews, 37*, 1–12. https://doi.org/10.1016/j.rser.2014.05.001

Mulyoutami, E., Rismawan, R., & Joshi, L. (2009). Local knowledge and management of simpukng (forest gardens) among the Dayak people in East Kalimantan, Indonesia. *Forest Ecology and Management, 257*(10), 2054–2061. https://doi.org/10.1016/j.foreco.2009.-01.042

Naik, S. N., Goud, V. V., Rout, P. K., & Dalai, A. K. (2010). Production of first and second generation biofuels: A comprehensive review. *Renewable and Sustainable Energy Reviews, 14*(2), 578–597. https://doi.org/10.1016/j.rser.2009.10.003

NASA Earth Observatory. (2021, August 14). *Deforestation in Papua*. NASA. https://earthobservatory.nasa.gov/-images/148021/deforestation-in-papua

Nelson, P. N., Gabriel, J., Filer, C., Banabas, M., Sayer, J. A., Curry, G. N., Koczberski, G., & Venter, O. (2014). Oil palm and deforestation in Papua New Guinea. *Conservation Letters, 7*(3), 188–195. https://doi.org/10.1111/conl.12058

Oon, A., Ngo, K. D., Azhar, R., Ashton-Butt, A., Lechner, A. M., & Azhar, B. (2019). Assessment of ALOS-2 PALSAR-2L-band and Sentinel-1 C-band SAR backscatter for discriminating between large-scale oil palm plantations and smallholdings on tropical peatlands. *Remote Sensing Applications: Society and Environment, 13*, 183–190. https://doi.org/10.1016/j.rsase.2018.11.002

Oosterveer, P. J. M. (2020). Sustainability of palm oil and its acceptance in the EU. *Journal of Oil Palm Research, 32*, 365–376. https://doi.org/10.21894/jopr.2020.0039

Ortmann, G. F., & King, R. P. (2007). Agricultural cooperatives I: History, theory and problems. *Agrekon, 46*(1), 40–68.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.

Pacheco, P., Gnych, S., Dermawan, A., Komarudin, H., & Okarda, B. (2017). *The palm oil global value chain: Implications for economic growth and socialand environmental sustainability*. Cifor. https://doi.org/10.17528/cifor/006405

Public Relation Directorate General of New and Renewable Energies and Energy Conservation. (2019, December 19). *FAQ : Program mandatori biodiesel 30% (B30)* [FAQ: 30% biodiesel mandatory program (B30)]. Esdm. https://ebtke.esdm.go.id/post/2019/12/19/2434/faq.program.mandatori.biodiesel.30.b30

Ramadhan, R., Mori, A., & Abdoellah, O. S. (2019). Shifting cultivation or oil palm plantation? Integrated assessment of land use change in Dusun Tonggong, Parindu, West Kalimantan, Indonesia. *International Journal of Sustainable Future for Human Security, 7*(1), 11–17. https://doi.org/10.24910/jsustain/7.2/1117

Ramadhan, R., Salman, F., Mori, A., & Abdoellah, O. S. (2021). *Shifting cultivation* (pp. 1–20). Journal of Sustainable Forestry. https://doi.org/10.1080/10549811.2021.2007491

Rausch, L. L., & Gibbs, H. K. (2016). Property arrangements and soy governance in the Brazilian state of Mato Grosso: Implications for deforestation-free production. *Land, 5*(2) https://doi.org/10.3390/land5020007

Sadatshojaei, E., Wood, D. A., & Mowla, D. (2020). Third generation of biofuels exploiting microalgae. In Inamuddin & A. Asiri (Eds.), *Sustainable Green chemical processes and their allied applications* (pp. 575–588). Springer. https://doi.org/10.1007/978-3-030-42284-4_21

Saikkonen, L., Ollikainen, M., & Lankoski, J. (2014). Imported palm oil for biofuels in the EU: Profitability, greenhouse gas emissions and social welfare effects. *Biomass and Bioenergy, 68*, 7–23. https://doi.org/10.1016/j.biombioe.2014.05.029

Saladini, F., Patrizi, N., Pulselli, F. M., Marchettini, N., & Bastianoni, S. (2016). Guidelines for emergy evaluation of first, second and third generation biofuels. *Renewable and Sustainable Energy Reviews, 66*, 221–227. https://doi.org/10.1016/j.rser.2016.07.073

Saswattecha, K., Hein, L., Kroeze, C., & Jawjit, W. (2016). Effects of oil palm expansion through direct and indirect land use change in Tapi river basin, Thailand. *International Journal of Biodiversity Science, Ecosystem Services & Management, 12*(4), 291–313. https://doi.org/10.1080/21513732.2016.1193560

Silalertruksa, T., & Gheewala, S. H. (2012). Food, fuel, and climate change: Is palm-based biodiesel a sustainable option for Thailand? *Journal of Industrial Ecology, 16*(4), 541–551. https://doi.org/10.1111/j.1530-9290.2012.00521.x

Sofiyuddin, M., Suyanto, S., Kadir, S., & Dewi, S. (2021). Sustainable land preparation for farmer-managed lowland agriculture in Indonesia. *Forest Policy and Economics, 130*, 102534. https://doi.org/10.1016/j.forpol.2021.102534

Song, X.-P., Hansen, M. C., Potapov, P., Adusei, B., Pickering, J., Adami, M., Lima, A., Zalles, V., Stehman, S. V., Di Bella, C. M., Conde, M. C., Copati, E. J., Fernandes, L. B., Hernandez-Serna, A., Jantz, S. M., Pickens, A. H., Turubanova, S., & Tyukavina, A. (2021). Massive soybean expansion in South America since 2000 and implications for conservation. *Nature Sustainability, 4*(9), 784–792. https://doi.org/10.1038/s41893-021-00729-z

The Gecko Project. (2018). *The secret deal to destroy paradise: The story behind the single biggest threat to the rainforests of Indonesia*. https://thegeckoproject.org/the-secret-deal-to-destroy-paradise-715b1ffc0a65

van Vliet, N., Adams, C., Vieira, I. C. G., & Mertz, O. (2013). "Slash and burn" and "shifting" cultivation systems in forest agriculture frontiers from the Brazilian Amazon. *Society & Natural Resources, 26*(12), 1454–1467. https://doi.org/10.1080/08941920.2013.-820813

Vijay, V., Pimm, S. L., Jenkins, C. N., & Smith, S. J. (2016). The impacts of oil palm on recent deforestation and biodiversity loss. *PLoS One, 11*(7), e0159668. https://doi.org/10.1371/journal.pone.0159668

Wiratmini, N. P. E. (2019, September 5). *Pemerintah pastikan harga biodiesel tak lebih mahal dari solar* [The government ensures that the price of biodiesel is not higher than diesel]. Bisnis.com. https://ekonomi.bisnis.com/read/20190905/44/1145105/pemerintah-pastikan-harga-biodiesel-tak-lebih-mahal-dari-solar

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Chapter 11
The Dynamics of the Green Policies in Papua Land: A Political Economy Study

Yulia Indrawati Sari

Abstract The provincial governments of Papua and West Papua have expressed their commitments and enacted policies to develop Papua Land in a sustainable manner through the issuance of Papua 2100 Vision, the 2019 Manokwari Declaration, and the 'green' spatial plan of Papua province. However, the implementation of these policies in balancing protection of forests and improvement of livelihood of indigenous Papuans has been slow. By employing a political economy approach, the study explores how interactions between the political economy structure, institutions, and actors have resulted in slow implementation of such commitments, particularly in reviewing the compliance of land-based industry licenses and acknowledging customary (adat) areas. The study was conducted between February 2020 and March 2021 and encompassed approximately 50 key informant interviews – including donors, civil society organizations, adat leaders, national and subnational governments, observers, academics, and journalists – and document review. The findings of this study suggest that the reform is mainly driven by development partners and limited numbers of bureaucrats that align with the indigenous Papuans' interest to protect their land from outsiders. The small coalitions were successful in focusing their effort to enact green policies in the two provinces. However, the study highlights constraints faced by these actors to turn the policies into actions: (1) the existence of wide array of powerful actors – non-Papuans and Papuans – with strong economic and political interests identified at central, provincial, and regency level to hinder the enforcement of problematic land-based licenses and clarify adat areas; (2) the absence of broad-based political support. These have hampered the implementation of the green policies under the two aspects above. This study recommends reviewing policy at the national level to create enabling environment for green policies implementation in both provinces, e.g., to review the Omnibus Law, supporting the regency-level actors to accelerate issuance of the perda PPMHA and local-level regulations on adat-managed areas, supporting licenses review in Southern part of Papua Province to limit the operation of these

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businesses to expand in forest areas and disrespect adat rights over their lands, and exploring engagement with the opposing parties at all administrative level.

Keywords *Adat* · Green policies · Papua · Reform

11.1 Introduction

The Papua and West Papua provincial governments have shown commitments to green development. In 2010, the provincial government of Papua declared the 'Papua Province 2100 Vision' to protect 90% of its land as forest areas and 60% as protected areas. In 2013, this green vision was clearly reflected in its Spatial Plan for 2013–2033 (*Rencana Tata Ruang Wilayah Provinsi* or RTRWP).[1] The provincial government of its neighbour, West Papua, declared the province a 'Conservation Province' in 2015. This green target was then further affirmed in the Manokwari Declaration three years later, consisting of various commitments including to protect 70% of the land areas of both provinces.

This green vision offers a great opportunity to develop these easternmost provinces in Indonesia[2] in a sustainable manner to prevent negative impacts to the environment and natural resources, as well as to the livelihood of indigenous Papuan people (*orang asli Papua* or OAP). This is particularly important since Papuan primary forest held 41% of Indonesia's remaining primary forest in 2020, covering an area of 19 million hectares (KLHK, 2021). This vision is also of great significance for many OAP who, historically, have faced marginalization and exclusion (Widjojo et al., 2008) and live under poor development conditions (Resosudarmo et al., 2009) to have access and control over natural resources to improve their livelihood while ensuring forest sustainability. Based on Indonesian Statistical Yearbook (2020), 21.7% and 26.8% of West Papua and Papua Provinces population, respectively, are still living below the national poverty line, much higher compared to the national average of 10.19% (BPS, 2020). Papua is also the province with the lowest and widest inter-district[3] disparity in the human development index.

By employing a political economy approach, this article aims to explore the gap between green policy formulation and the policy implementation. The main question to be addressed in this research is 'how do interactions among actors, institutions and structures promote or hinder green development policy formulation and its implementation?' This article begins with a description of the method of the study. This is followed by an explanation of the green policy formulation processes

[1] See local regulation (*peraturan daerah*, *perda*) of Papua No. 23/2013 on Papua Provincial Spatial Plan for 2013–2033.

[2] The term 'Papua Land' refers to the two provinces. We use 'Papua Province and West Papua Province' to refer to the specific provinces.

[3] In this article, we use 'district' to represent regency (*kabupaten*) and municipality (*kota*), not subdistrict (kecamatan or 'distrik' in Papua and West Papua context).

and milestones, an analysis of the challenges in the implementation, and ends with conclusions and recommendations.

11.2 Study Methods

This study employs a political economy approach that provides exploration on the dynamic interaction between actors, institutions, and structures to understand how decisions are made and how development outcome is produced (Unsworth & Williams, 2011; DFID, 2009). This approach assumes that policy success or failure is shaped by actors' strategy, contestation, and negotiation among various interest groups, particularly from those who gain or lose benefit from the policy (Leftwich, 2007). Different groups in society, especially political elites, have different interests and incentives to promote or to hinder policy implementation. Political economy analysis also looks at the relationship between the roles and power of actors in a broader context: that actors' incentives and strategy are closely related to the role of institutions and structures (DFID, 2009; Leftwich, 2007).

By employing the political economy approach, this study entails understanding on three inter-related concepts (Serrat, 2011; DFID, 2009). First, the role and strategy of actors – individuals, organizations, or coalitions – with both formal and informal influence in promoting or hindering environmental policy and its implementation (Harris, 2013). Second, the role of formal and informal institutions that limits or promotes actors' role and strategy to formulate and implement environmental policy, which tend to be more susceptible to change in the medium term than structural features (see North, 1990). Third, the role of political economy structure in driving actors' role and strategy in promoting and hindering green development. The term 'structure' refers to well-established economic, social, cultural, and ideological systems that influence actors' strategy and is relatively more difficult to change than institutional factors (DFID, 2009; Leftwich, 2007). This study also assesses the policy implementation of green development policies, particularly in the areas of review of land-based industries in mining, forest and plantation concessions and acknowledgement of *adat* areas.

In regard to the data collection method, this study employs interviews as the main data gathering method. Fifty informants who were involved in the formulation and implementation of the green policies were interviewed, consisting of donors, civil society organizations, *adat* leaders, national and subnational governments, observers, academics, and journalists. The interviews were conducted in two phases: face-to-face interviews in Jakarta, Jayapura, and Manokwari in February 2020, followed by interviews between May and August 2020, conducted online due to the COVID-19 pandemic.[4] The researchers also participated in ten webinars on the

[4] Due to the sensitive nature of the research, identity of all informants will be kept confidential in this report.

topics of green policy implementation in the Papua Land. Due to time constraints and pandemic situation, the study focused on interviewing key informants who involved in the policy formulation and implementation and did not interview communities and hence, the findings of this study must be seen in the light of these limitations. This study also reviewed government documents and statistical data, articles, media coverage and investigative reports from credible organizations to complement the primary data.

11.3 Green Policies Formulation Milestone

The study identifies green policies in both provinces were initiated by international development partners and a limited number of provincial-level bureaucrats that meet with the interest of OAP to protect their rich resources from outsiders. In Papua Province, the ideas were first introduced by the Department for International Development (DFID) of the Government of the United Kingdom through its Multi-stakeholder Forestry Program (MFP) in 2000–2008, followed by a capacity-building program and technical assistance supported by the UK Foreign Commonwealth Office (FCO) in 2009–2011. The UK consultants formed a solid team with experienced facilitators from Indonesia and collaborated with then Head of the Provincial Development Planning Agency (Bappeda), Alex Rumaseb, under the support from (then) Governor Barnabas Suebu. One of the milestones was capacity-building activities that were systematically developed to train civil servants, targeted at Bappeda officers, starting in 2009. The participants were limited to only 15 people, known as '*Tim 15*', consisting of 12 Bappeda staff and three officers from other provincial offices. In addition to the FCO program, a United States Agency for International Development (USAID)-funded program also supported Bappeda in drafting the spatial plan, which reflects sustainable land use management. By employing the 'system thinking' method with a strong process-oriented approach, not less than 32 workshops were held intensively in isolated places which effectively shaped *Tim 15*'s awareness on the policy's effects on OAP lives and on the environment. The process resulted in the production of the Papua Province 2100 vision to maintain 90% of its land as forest areas with OAPs as change agents in 100 years as well as the 'green' 2013–2033 Spatial Plan in December 2013 (DFID, 2019).[5]

Similarly, the green policy formulation process in West Papua Province was marked by two declarations, namely the Conservation Province Declaration on 19 October 2015 and the Manokwari Declaration at the International Conference on Biodiversity, Ecotourism and Creative Economy Papua (ICBE) on 10 October 2018.

[5] The information in this paragraph is based on interviews with the following key informants: a DFID consultant involved in the project on 19 May 2020; aid agency on 6 February 2020; former head of Bappeda on 17 February 2020; '*Tim 15*' members on 18 February 2020 and on 9 June 2020; and facilitators on 19 May 2020.

The idea of the Conservation Province was first discussed in mid-2013 in a small circle among then West Papua governor (Abraham Atururi), West Papua Provincial Secretary (Nathaniel Mandacan), and academics from Papuan University (UNIPA) – Agus Sumule and Charlie Heatubun – facilitated by Ketut Sarjana Putra from Conservation International (CI). The governor declared West Papua a Conservation Province in 2015. In 2017, the United Kingdom Climate Change Unit (UKCCU) continued to stimulate green policies in West Papua with other development partners through its Papua Initiative program. They closely worked with the Head of the Provincial Research and Development Board (Balitbangda), Charlie Heatubun, under the support of Governor Dominggus Mandacan and the Provincial Secretary, Nathaniel Mandacan. The coalition also involved a wider group of international development organizations and local civil society organizations (CSOs). On 10 October 2018, Governor Mandacan signed the Manokwari Declaration at ICBE, which was considered a sign of his commitment to green development policies. The Manokwari Declaration contained 14 points to achieve the shared vision of Tanah Papua as a 'Land of Peace, Sustainability, and Dignity' (Cámara-Leret et al., 2019). The provincial government of West Papua issued a special regional regulation (*peraturan daerah khusus or perdasus*) on Sustainable Development in West Papua Province (No. 10/2019) dated 29 November 2019. In a consultation process prior to the issuance of the *perdasus*, the Ministry of Home Affairs requested to change the title from 'Conservation' to 'Sustainable Development' as conservation is considered the national government's authority.[6]

The Central Government seems to have different priorities in developing Papua Land. It has promoted investment in Papua to accelerate economic growth in Papua and West Papua provinces. This was manifested in the form of a central government request to allocate land for investment in Papua, despite the Papua 2100 vision. In mid-2013, *Tim 15* rejected the central government's request to allocate 2.5 million hectares of land for the Merauke Integrated Food and Energy Estate project (MIFEE). *Tim 15* was safeguarding 228 hundred hectares allocated for MIFEE in the draft RTRWP that was deliberated by the provincial DPRD and eventually issued.[7] They protected about 2.3 million hectares of forests through the issuance of the RTRWP.[8]

In the Papuan context, the sustainable development and conservation narrative provides opportunities for key players in the provincial governments to gain recognition from international actors and access to climate finance while at the same time also trying to adhere to the special autonomy narrative, 'Protecting rich natural resources for the benefit of OAP'. The top provincial leaderships support green

[6] This paragraph is based on interviews with key informants from CI on 11 February 2020; CSO on 23 January and 20 February 2020; and aid agency on 23 January 2020.

[7] Based on interview with Tim 15 member who represented the provincial government on 9 and 12 June 2013.

[8] There is limited data available on the amount of forest confiscated by MIFEE, but Yayasan PUSAKA's investigation (2011) indicates that most of the land for MIFEE licenses is located in forest areas.

policies to make Papua Land nationally and globally recognized, while gaining popularity among elite Papuans, thus providing advantages to expand broad-based political support. Opportunities to access funding for the environmental agenda have also provided incentives for top leaderships and academia to strongly support this policy. Following the Paris Agreement in 2015, climate finance has been available in the form of international public and private funding to incentivize and compensate reduction of greenhouse gas emissions. In 2017, total climate-related financing was $510 billion to $530 billion globally, indicating a steady increase in fund from 472 billion in 2015 and USD 455 billion in 2016 (CPI, 2018). Furthermore, as the last reserve of tropical forest with high biodiversity, many international organizations have environment protection agenda in Papua and West Papua provinces, including in accessing climate financing.

The idea of sustainable development in Papua province is particularly in line with the narrative and discourse on marginalization of OAP. Many OAPs, including those holding position in provincial governments, have perceived that the OAP has limited control over their own land and hence, the green policy idea introduced by international organization was highly supported. Members of *Tim 15* have experienced discrimination themselves and have listened to marginalization stories told by the elderly and the media that their poverty and impoverishment are the result of decades of exploitation of their land, rich with natural resources, by outsiders without empowering them as indigenous people. A member of *Tim 15* from Bappeda clearly said, '... the most important thing for Papua in this provincial planning in the long term is how to protect Papuan land so that it remains sustainable while continuing to improve the quality of life of OAP. Simply put, we don't want Papuan land to be crowded with non-Papuan actors while the OAP are not ready (yet)…'. In several conversations, a more assertive and stronger narrative was developed, such as 'if we don't protect our forest, Papuans will not get anything. Non-Papuans will get the benefits. Otherwise, Papuans can still sustainably manage our forest for our livelihoods'.[9]

11.4 Slow Implementation of Green Policies

To understand the extent to which green policies in Papua Land have been implemented, this study identifies two areas of policy implementation that are considered to represent the main objectives of the green policies: forest conservation and empowerment of OAP. The main threat to the former is unlawful licenses for land-based industries – plantation, mining, and forestry. With regard to the latter, acknowledgement and protection of *adat*-managed land is considered one of the best solutions, given the development situation in Papua Land that is also expected

[9] Interview on 18 February 2020.

to contribute to the first objective (de Royer et al., 2018).[10] Hence, review of land-based industry licenses, followed by reducing or repealing unlawful licenses, and formal acknowledgement of *adat*-managed land were selected as indicators for green policy implementation in the two provinces.

11.4.1 Law Enforcement on Land-Based Industry Licenses

While no significant new licenses were granted under the Joko Widodo administration (2014–2024), the study identifies excessive licenses granted during the period of President Susilo Bambang Yudhoyono (SBY) in 2004–2013. The licenses were given based on previous Law No. 32/2004 regarding Subnational Governments ('the Autonomy Law'), whereby the regency/municipal governments still have authorities to issue plantation,[11] mining, and forestry licenses. Based on our assessment,[12] approximately 169 and 153 permits on mining, plantation, and forestry sectors were issued in Papua and West Papua provinces, respectively, in the period of 2004–2013. These include 34 forestry licenses granted by the Ministry of Forestry and 48 plantation licenses issued by regents (*bupati*). Approximately 86% of 240 mining licenses were issued by *bupatis*, while the remaining licenses were granted by the Ministry of Energy and Mineral Resources and governors. Most of these companies are not (yet) actively operating and are assumed to be either storing land for the future (known as 'land banking') or stranded.[13] Qualitative data obtained through interviews reveal that only few concessionaires have started operating their primary businesses as per the licenses, indicating their strategy in targeting in targeting forests for logging activities.[14]

Based on the regulations, the licenses can only be granted in non-forest areas (other utilization areas or *area penggunaan lain*/APL). However, some of the concession areas are located in protected areas. Based on our analysis on GIS data, approximately 5.9 million hectares of the area belong to 114 licenses and 123,000 hectares from 33 licenses are located in the protected areas of Papua and West Papua provinces, respectively, between 1994 and 2016. In Papua province, the allocation

[10] Interviews with forestry and green policy expert from Bogor Agricultural University, 4 June 2020, ICEL (Indonesian Center for Environmental Law), 21 May 2020, and advisor of MoEF, 5 May 2020. See also de Royer et al. (2018) on community-based forestry management in Indonesia.

[11] In particular, palm oil refers to the United Nation's Food and Agriculture Agency's (FAO) classification system and hence is classified as subsector of agriculture under plantation licenses, not as a forestry crop (Astuti et al., 2022).

[12] The assessment used unpublished GIS data which contains licenses and forest areas information compiled by Forest Watch Indonesia (FWI) from various sources. In Papua province, the study team also uses SIMTARU or Papua Management Information System for Spatial Planning.

[13] Interviews with informants from Mongabay, 10 June 2020 and Papua Forest Watch, 19 May 2020.

[14] Interviews with informants from Yayasan PUSAKA, 11 May 2020; Mongabay journalist, 10 June 2020; and Papua Forest Watch, 19 May 2020.

for land-based industries is also not in line with the existing green spatial allocation in the 2013–2033 RTRWP.[15] Our qualitative interviews also highlight that most of the 'problematic' licenses are located in the southern part of Papua province, particularly in Merauke and Boven Digoel regencies, known as the Merauke Integrated Food and Energy Estate (MIFEE).[16] Investigations conducted by the Gecko Project (2019, 2020) revealed fraudulent processes in processing mega project permits in Boven Digoel, Papua, leading to clearing of a vast area of rainforest in the region.

Since 2011, through the issuance of Presidential Instruction (*Instruksi Presiden or Inpres*) No. 10/2011 in May 2011, the central government imposed a policy to protect forest by enacting moratorium of new licenses for primary natural forests and peatlands located in conservation forests, protected forests, production forests (limited protection forests, permanent production forests, production forests that can be converted) and other utilization areas (*area penggunaan lain* or APL) based on Indicated Map of Moratorium of New Licenses. The *Inpres* was valid for two years and have been renewed every two years.[17] In September 2018, the government issued *Inpres* No. 8/2018 on moratorium and evaluation of licensing for oil palm plantations and increasing the productivity of oil palm plantation. These policies have constrained the issuance of land-based industry licenses after 2013. Interviews with an officer from Investment and Integrated One-Stop Services Agency[18] and with a forestry expert of Papua Province[19] suggest that the moratorium has constrained the oil palm plantation licenses as there are no new licenses granted after the moratorium.

Hence, conducting already granted license review of land-based industries and following up review results with law enforcement are of great significance to avoid potential environmental damages and adverse human right impacts in the future. Any attempts to actively review the problematic licenses and to follow up the review results indicate serious commitment in implementing green policies. In this case, local actors – provincial and district governments, NGOs – in collaboration with national-level NGOs and donor organizations have conducted efforts to review land-based licenses. Despite some improvements of license review in West Papua Province, the study finds that the review process has remained slow and limited improvements have been made in dealing with problematic companies. The study notes that the Energy and Mineral Resources Office of Papua province conducted license review and discontinued nine expired mining licenses.[20] In West Papua, only

[15] Interview with Provincial Papua BAPPEDA staff, 18 February 2020.

[16] Interviews with informants from Yayasan PUSAKA, 11 May 2020, and Papua Forest Watch 19 May 2020. The project was launched by President SBY's administration in 2008 with an ambition to make Merauke District the source of food security and energy for the nation.

[17] The following Inpres were issued with similar mandates with Inpres No. 10/2011: Inpres No. 6/2013, 8/2015, 6/2017, and 5/2019.

[18] Interview on 13 February 2020.

[19] Interview on 18 February 2020.

[20] Five of the companies sued the government in the State Administrative Court (PTUN); two of the cases were accepted, while three others were rejected (TAF, 2020).

the Regent of Sorong, Johny Kamuru, has stopped location permits, environmental permits, and plantation business permits for four palm oil companies located in the territory of the Moi indigenous people.[21] In plantation sectors, the West Papua province's Food, Horticulture and Plantation Crops Office, supported by EcoNusa and other CSOs, has submitted the review results of palm oil plantations in West Papua Province to the National Movement for the Rescue of Natural Resources-Corruption Eradication Commission (*Gerakan Nasional Penyelamatan Sumber Daya Alam Indonesia-Komisi Pemberantasan Korupsi* GNPSDA-KPK).[22] Based on the review results published in February 2021 (West Papua province's Food, Horticulture and Plantation Crops Office, 2021), the Regents in South Sorong, Sorong, Teluk Bintuni, Teluk Wondama, and Fakfak have revoked approximately four, four, two, one, and one palm oil plantation licenses respectively or 12 licenses in total (Elisabeth & Hariandja, 2021). But in general, the provincial and district governments, particularly in Papua Province, have not revoked problematic business licenses of companies which are granted under their authorities, i.e., plantation sectors that have caused environmental damage and disrespected indigenous rights. Existing licenses covering concessions in protected areas are still active, including problematic oil palm plantation project in the southern part of Papua Province.

However, NGO actors have been concerned with the continuation to advocate the licensing review process for problematic land-based industries, including the issuance of new permits, considering the changes to the rules after the enactment of Law No.23/3014 which reduced the authority for granting permits at the provincial and district levels.[23] The Law No. 23/2014 shifts mining and forestry authorities to grant licenses to the provincial and central level. The Law No. 3/2020 on Mineral and Coal Mining and the Law No. 11/2020 on the Omnibus Law has shifted mining authority back to the Central Government. The regency/municipal governments only hold the authority to issue plantation permits in other utilization areas (*area penggunaan lain* or APL)[24] and to provide recommendations for the issuance of mining and forestry permits to date. This means that various initiatives to review permits as an effort to implement green policy in Papua land must be strengthened by efforts to create a conducive policy environment for green policy at the central level.

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[21] Based on media coverages reported in KOMPAS (https://regional.kompas.com/read/2021/09/02/151231078/cabut-izin-perusahaan-sawit-demi-bela-hak-masyarakat-adat-bupati-sorong) and CNN (https://www.cnnindonesia.com/nasional/20210830213725-12-687539/cabut-izin-operasi-bupati-sorong-digugat-perusahaan-sawit).

[22] Interviews with EcoNusa Foundation, 23 January 2020 and Head of West Papua Province Food Crops and Horticulture Office, 13 February 2020.

[23] Interview on 10 February 2022, 12 February 2022, 18 February 2022, and 13 May 2022.

[24] Based on attachment of Law 23/2014 on Division of Authority between Central and Subnational Government and Law 39/2014 on Plantation, and elaborated in the Attachment I of PP 5/2021 on Risk Based Licensing as implementing regulation of Law 11/2021 (Job Creation Law), the regency/municipal governments still hold the authority to issue plantation, including palm oil permits particularly in other utilization (APL).

Furthermore, the issuance of the new Law on Mineral and Coal Mining (No. 3/2020) and the Omnibus Law on Job Creation (No. 11/2020) may have potentially constrained this activity further. These laws recentralize the authority for issuing and monitoring mining licenses from the provincial governments. Hence, technically the provincial governments are not allowed to issue a provincial-level moratorium or revoke unlawful licenses without any delegation of authority from the central government. The Omnibus Law particularly creates opportunity for the central government to overrule the subnational spatial plans in the case that they are not aligned with national strategic projects (Sembiring et al., 2020). The Omnibus Law which provides a mechanism for legalizing illegal plantations with various administrative fines and amnesty mechanisms is also feared to have a detrimental effect on protected forests and peatlands (Astuti et al., 2022). By changing the land swap policy into applying administrative fines and tax amnesty to secure license, the illegal plantations can be granted with forest release certificate and hence, the Omnibus law is viewed by researchers and conservation organizations to have limited concern over forest restoration mechanism (Astuti et al., 2022, 7).

11.4.2 Recognition and Protection of Adat Communities

Based on the '*adat* forest' scheme as a part of the social forestry program promoted by the Joko Widodo administration since 2014, the first step of granting the rights to an *adat* community is by acknowledging and protecting the subject community through a local regulation (*peraturan daerah* or *perda*) that must be deliberated and approved by the local legislative council (DPRD). However, despite very strong narrative of *adat* in Papua Land, the number of *perdas* to acknowledge and protect the *adat* communities (*pengakuan dan perlindungan masyarakat hukum adat*, PPMHA) is still very low – only five out of 42 regencies/municipalities in Papua Land have enacted such regulations, four regencies in West Papua and only one regency in Papua Province, by 2018. Furthermore, a regent/mayor regulation acknowledging the *adat*-managed land (the object) and, if the land is located in the forest area, a Minister of Environment and Forestry decree on *adat* forest must be issued to grant the management to the *adat* community. The progress of this is even poorer, as only two regency governments have issued the regent regulations and no ministerial decree on *adat* forest rights in Papua Land has been issued by 2019.

The study also highlights that development agencies have actively worked in reviewing licenses and promoting *adat* areas. In the review process, financially supported by international donor agencies, various development partners in collaboration with local CSOs such as The Asia Foundation (TAF), World Resource Institute (WRI), Indonesian Center for Environmental Law (ICEL), EcoNusa, Mnukwar, Jerat Papua, and World Wildlife Fund (WWF) Indonesia have supported both provincial governments in reviewing land-based industry licenses. These agencies have made progress in building the capacity of CSOs and the provincial governments to conduct license review using a license review tool identifying unlawful mining and

oil palm plantation licenses as discussed above.[25] In regard to acknowledgement of *adat* areas, the development partners and local CSOs in West Papua have succeeded in compiling approximately 3.4 million hectares of customary land maps that can be used to be integrated into the revision of the West Papua RTRWP and issuance of *perda* for PPMHA as discussed above[26]. By October 2021, the revision of RTRWP has included *adat* areas in eight regencies in West Papua province and the provincial government is still discussing the incorporation with the Ministry of Agrarian Reform and Spatial Planning.[27]

In addition, the slow implementation of green policies in the two provinces is also indicated by limited budgetary support for green sectors such as the environment and forestry, agriculture, and marine affairs. Based on analysis of their 2015–2020 provincial budgets, the total budget allocations related to green policies in Papua and West Papua have averaged only 3% and 5% of total expenditures, respectively, and most of them come from earmarked transfers such as the Reforestation Fund and Special Allocation Fund. According to officials in West Papua, this limited allocation has prompted them to cooperate with development partners. Qualitative interviews with key informants[28] also reveal limited change in terms of Papua and West Papua provincial government programs and activities after the enactment of the green policies. They emphasized the fact that the government are still running the same programs as before the policy. There are no new programs, methods, or improved budgets implemented by the relevant offices to support the implementation of the green policy.

In the context of a strong narrative of *adat* role as well as strong practices of customary land arrangement, it is expected that *adat* leaders will help protecting their lands from land-based investments and promoting the recognition of *adat* law. However, *adat* leaders do not always support the idea to reject the land-based investment and to clarify their *adat* territories. Qualitative interviews with *adat* leaders[29] generally show their enthusiasm for the idea of green policies, with strong emphasis that the conservation program does not prevent the community from utilizing natural resources for their welfare, and hence, *adat* leaders' perspectives are divided between those who reject investment and ask for full control over natural resources, those who welcome investment to improve their welfare, and those who want both development and welfare for OAP (see also Cahyono et al., 2020). The efforts of companies to provide tangible incentives and give false and partial information to obtain the approval of traditional leaders are one of the reasons why some *adat* leaders eventually choose to support land-based investment in Papua (Cahyono et al., 2020; The Gecko Project & Mongabay, 2019b). The situation of unclear land tenure

[25] Interviews with informants from EcoNusa Foundation, 23 January 2020 and Head of West Papua Province Food Crops and Horticulture Office, 13 February 2020.

[26] Based on FGD results with NGOs in Manokwari involved in adat mapping task force, 10 February 2020.

[27] Interview with a member of adat mapping task force, 30 October 2021.

[28] Interviews with Bappeda officers and from development partners, 17 and 18 February 2020.

[29] Interview on 5, 17, and 20 February 2020.

and ownership conflict in Papua land also provide *adat* leaders with opportunities to get cash or any form of compensations from those who will purchase the land. This is a common practice that settlement money for land purchase in Papua is rather uncertain as any strong figures among and between clan could ask for the compensation.

Communities also have varying perspectives on land-based investments and the extent to which they conserve forests for welfare. A study by Cahyono et al. (2020) identifies cases of protests by *adat* communities against oil palm plantations as well as those in *adat* communities who wanted to get out of poverty immediately and gave up their land for investment, causing tensions and divisions among *adat* communities. Sophie Cao (2020; The Gecko Project & Mongabay, 2019a), an anthropologist who researched the Marind Tribe in Merauke also points out different and varied perspectives of young generation of *adat* regarding the operation of oil-palm investment in their land. She finds young people who support palm oil and want a modern life as well as young people who want to protect rituals and nature and she also recognizes young people who want to adapt and change culture to be able to survive with progress while still maintaining their control over natural resources. As also a case in how *adat* leaders gave permits to release lands, the studies also explain the practice of companies to provide partial and false information to communities regarding their rights and consequences in giving their land to investments (The Gecko Project & Mongabay, 2019a) and give false promises to pay for school children's education, facilitate *adat* own communities' plantation, and pay money rent to each clan, alluring some groups of communities to choose selling their land for investment (Cahyono et al., 2020). Both studies (Cahyono et al., 2020; The Gecko Project & Mongabay, 2019a) highlight that the release of forest for land-based investment does not only causes loss of food sources and livelihoods of *adat* communities, but also affects their value and support systems, traditions, rituals, languages, religion, and local knowledge.

In addition, civil society groups continue to strive to promote recognition and protection of OAP in a rational and constitutional manner by empowering indigenous people including providing technical facilitation for mapping *adat* territories and advocating for regulations on the recognition of *adat* territories. In Papua land, this recognition of *adat* territories has been made possible with the special autonomy status of Papua and West Papua Provinces. Article 4 of the Special Autonomy (*Otonomi Khusus* or *Otsus*) Law (No. 21/2001, reiterated in the Law No. 2/2021) and its explanation note provide additional authorities to the provincial government of Papua, including in utilizing its natural resources and managing conservation. In accordance with the Otsus Law, the provincial government of Papua issued special autonomy regulations (*peraturan daerah khusus or perdasus*) No. 21/2008 on Sustainable Forest Management in Papua Province, No. 22/2008 on Natural Resource Protection and Management of Papua's Customary Legal Communities (Masyarakat Hukum *Adat*, MHA), and No. 23/2008 on Traditional Rights (*Hak Ulayat*) of MHA and Individual Rights of Papua's MHA. These regulations stipulate that MHA in Papua province has rights over the natural forests based on each customary (*adat*) area and authorize the provincial and local governments to grant

utilization land and forest rights to the MHAs. Nonetheless, these regulations have not been effectively implemented as the Ministry of Forestry (and later, the Ministry of Environment and Forestry) has not issued the norms, standards, procedures and criteria (*norma, standar, prosedur, dan kriteria,* or NSPK) as central government's authorization to the provincial government of Papua in managing these concurrent authorities. Hence, authority over the forestry sector in Papua and West Papua is practically the same with other provinces in Indonesia. These efforts are also hindered by CSOs' limited working areas and funding sources that rely on the support from development partners, shortage of human resources and technical capacity in terms of facilitation and standardized mapping, so that maps of *adat* territories can be optimally integrated into regency/municipality city spatial planning.

11.5 Support for Land-Based Investment in Papua Land

Obstacles in controlling land-based industry practices are beyond development partners' and CSOs' supports. The study identifies those powerful actors who have promoted land-based investment and resisted license reforms that would negatively impact their operations.

Based on credible investigative reports (Cahyono et al., 2020; The Gecko Project, 2019, 2020a, b; The Gecko Project & Mongabay, 2019a, b, 2020a, b; Ginting & Pye, 2011) and interviews with key informants,[30] the large companies granted the land-based industry licenses are very powerful. The companies offer strong incentives for *adat* leaders to support them and release their lands by giving them monthly allowances and entertaining them with stays in nice hotels, women and 'going to bars'.[31] The Gecko Project revealed the involvement of a head of *adat* leaders in Boven Digoel in ensuring that one palm oil company was granted a license. These companies often conduct fraudulent procedures and are able to obtain permits from the state which appear to be 'legal' but in principle are illegitimate and harm OAP (Cahyono et al., 2020; Chao, 2020; The Gecko Project & Mongabay, 2019a, b, 2020b).

Some members of regency DPRD and government officials are often behind the investments, as they gain direct benefits from investments by receiving cash from granting licenses in the plantation sector, logging revenues, and land clearing for plantations (Cahyono et al., 2020; The Gecko Project, 2019; The Gecko Project & Mongabay, 2019b; Resosudarmo, 2005). They have strong interests in opening their regencies for land-based investments such as palm oil or mining. The investigative report from the Gecko Project (2019) and interviews with members of *Tim 15*

[30] Interviews with informants from Yayasan PUSAKA, 11 May 2020; Mongabay, 10 June 2020; and Papua Forest Watch, 19 May 2020.

[31] Information from Webinar 'Modus Tipu-tipu Perusahaan Ekspansi Perkebunan Sawit di Tanah Masyarakat Adat Papua', Greenpeace Indonesia, 7 August 2020 and Webinar 'Mengungkap Kejahatan Korporasi di Papua', TUK Indonesia, 30 June 2020.

identify the involvement of *bupati* in releasing their land for palm oil corporations.[32] For instance, the Regent of Merauke for the 2000–2010 period, John Gluba Gebze, supported the central government's agenda in releasing land for the MIFEE project. The Gecko Project's investigative report (2019) also shows the involvement of the Regent of Boven Digoel, Yusak Yaluwo, in granting licenses for palm oil corporations in this regency known as 'Tanah Merah'. Both *bupatis* granted licenses in areas that were not in line with the existing spatial allocations in the Papua 2013–2033 RTRWP. The study does not indicate any significant evidence of central government measures and action in addressing this issue.

Several major structural obstacles present challenges to the implementation of the review process. One main threat is the coalition between national and local actors of land-based industries. Companies have affiliations with powerful actors at local and national levels. The Gecko Project reports (2019, 2020a, b) as well as other investigative reports from Pusaka (2020) and Down to Earth (n.d., 2012) point out that some large palm oil plantations received many concessions during the New Order era and had strong affiliations with the ruling party and military commanders at that time. Investigative reports on companies granted licenses also identify many other groups, including medium-scale companies, that are linked to various political parties and influential figures in the government. MIFEE is a very good example to identify the powerful network behind the issue of licensing for land-based investment in Papua. The project was launched by President SBY's administration in 2008 with an ambition to make Merauke regency the source of food security for the nation. Based on analysis of data from various sources from Down To Earth and Pusaka Foundation as well as a report by Longgena Ginting and Oliver Pye (2011), the companies with MIFEE licenses – both local and international companies – are linked to various political parties and influential political actors since the New Order era.

Furthermore, The Joko Widodo administration continues to maintain a strong perspective for investment and economic growth in Papua Land, as indicated in the National Medium-Term Development Plan (*Rencana Pembangunan Jangka Menengah Nasional* or RPJMN) for 2020–2024. At the macro level, until 2018 Papua and West Papua Provinces only contributed around 1.9% of the total national GDP. This condition is considered as a form of inequality among regions and for 2024 the government has planned to increase the contribution of Papua Land to 2.1%. The RPJMN for 2020–2024 has set an ambitious economic growth target in Papua and West Papua Provinces of 6.5% and 7%, respectively, higher than the national growth target of 5.7%–6%. Although they are still high, civil society advocacy has successfully lowered these targets from the ones indicated in the initial 'technocratic draft' of the RPJMN of 9% economic growth in Papua Land. To meet

[32] As mentioned in the previous section, the authority of the regent in issuing plantation business permits (IUP) within the regency – not a recommendation – is still valid today. Amendments to the 2014 Regional Government Law do not change/transfer the regency's authority in plantation/agricultural affairs. This is also in line with Law 39/2014 on Plantations, where the Regent is still authorized to issue IUPs in district areas, particularly in APL area.

these targets, the central government needs to develop Papua Land through development of large-scale industries and major investment schemes. It plans to accelerate development in the island through seven major projects over the next five years, such as developing new city corridors and centres of national strategic activities and continuing to build connectivity infrastructure such as ‘air bridges’, main port networks, and roads (Trans-Papua) as well as a plan to continue food estate projects. As a part of post-COVID-19 economic recovery, the central government continues to build Food Estate project in southern part of Papua province at 2.6 million hectares (Elisabeth, 2021). This indicates that the central government still aims to develop Papua based on land-based industries that attract the involvement of large national and international companies.

The perspective on economic growth as development measures are also shared by relevant offices in provincial and regency governments. An interview with a member of *Tim 15* from Bappeda[33] also revealed that regency governments have complained about the Papua Province 2100 Vision and RTRW 2013. During the dissemination of RTRW 2013 to regency governments, representatives of the regency governments shared their concerns of not being able to develop and invite big investments due to the enactment of the two green policies. Officers from the Investment and Energy offices in the provincial governments have also questioned the green policies’ agenda, given investment targets from the central government.[34] They are also concerned about how to reduce poverty without investments.

11.6 The Absence of Broad-Based Political Support

Another obstacle is the absence of broader-based political support to strengthen the coalitions for reform. Despite the success of coalitions between international development partners and a few numbers of bureaucrats in enacting environmental policies in both provinces, they did not bring together a wide range of different actors who have interests and influence either to promote or to disrupt the green policies, ensuring these actors support the policies. This has hampered the implementation of green policies.

Our findings show that, by and large, there was no systematic effort to build a broader coalition, to actively engage with other stakeholders, even within the provincial government itself, and to deal with potential blockers of reforms. The foremost weakness is that the green policy formulation process in both provinces did not engage with other provincial offices, especially offices with an investment scope of work and function. Thirteen out of the Tim 15 who went through the systematic capacity and coalition building in Papua Province were Bappeda officers. The involvement of two participants from the Investment and Environment offices was

[33] Interview on 9 and 12 June 2020.

[34] Interview on 11, 13, and 20 February 2020.

insufficient to build political engagement with those two agencies. In West Papua Province, the discussions on both Conservation Province and the Manokwari Declaration were limited to top leadership in the provincial government without systematic capacity and coalition building within the government, including with Bappeda and the legislature. The engagement of the regency governments in deliberating green policies in Papua and West Papua was very limited, to say the least.

There was also only a limited process to build a strong coalition with potential allies: local CSOs, church-based organizations, and adat communities, including with members of the Papuan People's Assembly (MRP). Although local CSOs have recently engaged and collaborated with development partners and provincial governments as discussed above, their involvement in the deliberation and enactment of the green policies was limited. Local CSOs initially rejected the Conservation Province idea, stating that their preferred approach for sustainable development – empowering the OAPs while sustainably managing the forests – was not considered and was systematically excluded. Despite the involvement of local CSOs in the Manokwari Declaration, the green policy formulation lacked time to build a more deliberative process by discussing the ideas and objectives of the declaration with local CSOs. In Papua Province, local CSOs were only consulted in the process of formulating the 2013–2033 RTRWP without systematic efforts to build strong alliances with the CSOs. The completion of the FCO project in the end of 2013 further discontinued the process to disseminate the Papua Province 2100 Vision to broader groups outside the government. It is also important to note that the green formulation process in both provinces also did not consider engagement with church-based organizations, which have long played a strong role in humanitarian missions in Papua.

Building a broader coalition has also become a challenge on its own, since some key actors, such as development agencies and reform-oriented bureaucrats, were not keen to engage with other important stakeholders that have strong interests in investment and opposed the Green Development agenda. These actors include the central government, provincial and regency governments, regency legislative councils (DPRDs), land-based industries, regents, and business groups. The central and regency governments showed little support for Green Development and prioritized opening investments in Papua Land. The limited engagement with these opposing actors may be because they took no visible actions to terminate the process of Green Policies formulation in the two provinces. The nature of these actors may contribute to this; they did not think that the declarations were important and might hamper their 'business as usual'. This lack of systematic engagement with opposing actors resulted in a lack of political support from powerful actors that have interests in hindering green developments.

11.7 Conclusion and Recommendation

The findings of this study suggest that the reform is mainly driven by development partners, limited numbers of bureaucrats, supported by the governors, and networks of CSOs. These small coalitions were successful in focusing their effort to enact environmental policies in Papua and West Papua provinces. The green development narrative and its related terms such as sustainable development and customary forest offer strong political incentives for top leaderships in the provinces to support the idea. Furthermore, potential financial incentives for the provinces by protecting their forests also create more incentives for the leaders to adopt the policies.[35] However, the small coalitions failed to operationalize the policies, as indicated by slow implementation in enforcing lawfulness of land-based industry licenses and in issuing regulations to acknowledge and protect *adat*-managed lands, which are crucial in operationalizing the green policies in both provinces. Several main reasons were identified, suggesting significant challenges faced by the green actors: the existence of wide-array powerful actors encompassing central and local actors with vested economic and political interests and the absence of a broader political support base. This include the presence of *adat* and local leaders who support land-based investments and central government's unaligned priority on economic growth and the enactment of the Omnibus Law and the change of license regulations that potentially impede green policy implementation in the provinces. This indicates the complexity and heterogeneity of actors who hinder and support green policy and hence, suggests the importance to align green policy supports from all administrative levels, including from opposing parties.

The study identifies four recommendations, with an overarching recommendation for the green actors to expand their coalition with other development actors at all levels and to increase their power as described in detail below.

First, the study suggests that central government shows high priority on economic growth in developing Papua land as well as the potential negative impact of Omnibus law and recentralization of license regulations on green policy implementation. This indicates the importance to focus the policy change on the national level to create enabling environment for green policy implementation in both provinces. It is particularly important to revisit the Omnibus Law to ensure that various mechanisms, e.g., administrative fines and amnesty in the law are not used to legalize the illegal expansion of land-based industries at the expense of forest and environmental concerns. In particular, Astuti et al. (2022:10) have called for reorienting environmental legislation and the Omnibus Law 'to include greater scrutiny of, and punitive actions against, the illegal expansion of large plantations'.

[35] There is a growing opportunity for local government to tap the various climate funds both public sourced including Environmental Fiscal Transfer and Environmental Fund or market-based climate fund such as carbon fund. Local governments can access these funds by participating in either the result-based payment (RBP) scheme, carbon trading and other schemes.

Second, the study indicates the slow implementation to recognize *adat* areas despite the relevance of this regulation to increase land access for OAP welfare and control over their land while still allocating state forest for community management. Hence this study recommends the green actors to support the regency-level actors, to accelerate issuance of the *perda* PPMHA and local-level regulations on *adat*-managed areas, particularly in non-forest areas (APL) that do not require authorization of the MoEF. The national-level advocacy will also be important to resolve the issuance of NSPK for Papua and West Papua provinces.

Third, the study identifies that southern part of Papua is where most problematic land-based investments are located and hence it is important for the green actors to focus on the respective region to limit the operation of these businesses to expand in forest areas and disrespect *adat* rights over their lands. At the national level, development organizations and national NGOs could provide support to create enabling environment to conduct license reviews and follow up the results to advocate sanctions against the investments to central government actors such as GNPSDA-KPK. This includes supporting One Map Policy and investigative journalism and studies to disclose development policies and practices, including fraudulent licenses, that are against the spirit of the green policies in order to draw public, policymaker, and media attention, locally, nationally, and globally.

Fourth, to explore engagement with actors who promote land-based investment. The green actors need to engage with other political and business actors that have competing interests to find incentives for the latter to promote sustainable business practices to ensure that businesses operate in an accountable, transparent, and ethical manner. For example, enforcing environmental, social, and governance standards that linked to financial institutions investing in the businesses would limit environmental degradation and increase social benefits for local people.

References

Astuti, R., Miller, M. A., McGregor, A., Sukmara, M. D. P., Saputra, W., Sulistyanto, & Taylor, D. (2022). Making illegality visible: The governance dilemmas created by visualising illegal palm oil plantations in Central Kalimantan, Indonesia. *Land Use Policy, 114*, 202233. https://doi.org/10.1016/j.landusepol.2021.105942

Cahyono, E., Lutfi, A., Syatori, A., Budiono, W. A., Mahrus, M. A., & Ahsani, F. (2020). *Ekspansi Perkebunan Sawit, Korupsi Struktural dan Penghancuran Ruang Hidup di Tanah Papua: Cerita Krisis dan Perlawanan Tiga Komunitas Suku di Papua-Papua Barat*. Greenpeace Indonesia.

Cámara-Leret, R., Schuiteman, A., Utteridge, T., Bramley, G., Deverell, R., Fisher, L. A., McLeod, J., Hannah, L., Roehrdanz, P., Laman, T. G., Scholes, E., de Fretes, Y., & Heatubun, C. (2019). The Manokwari declaration: Challenges ahead in conserving 70% of Tanah Papua's forests. *Forestry and Society, 3*(1), 148–151. https://doi.org/10.24259/fs.v3i1.6067

Chao, S. (2020). *'In the plantations there is hunger and loneliness': The cultural dimensions of food insecurity in Papua (commentary)*. Mongabay. Retrieved from https://news.mongabay.com/2020/07/in-the-plantations-there-is-hunger-and-loneliness-the-cultural-dimensions-of-food-insecurity-in-papua-commentary/

CPI (Climate Policy Initiative). (2018). Global climate finance: An updated view 2018. Retrieved from https://www.climatepolicyinitiative.org/publication/global-climate-finance-an-updated-view-2018/

De Royer, S., Van Noordwijk, M., & Roshetko, J. M. (2018). Does community based-forest management in Indonesia devolved social justice or social cost? *International Forestry Review, 20*(2). https://doi.org/10.1505/146554818823767609

DFID. (2009). *How to note. Political economy analysis. A DFID practice paper*. DfID.

DFID. (2019). Annual review: Supporting a sustainable future for Papua's forests (referred to as Papua Initiative) in the period of 15/12/2017 to 31/07/2019.

Down to Earth (DTE). (n.d.). Annex A: companies that have obtained or are in the process of obtaining lands in Merauke. Retrieved from https://www.downtoearthindonesia.org/sites/downtoearthindonesia.org/files/MIFEE%20CERD%20Annex%20A.pdf?

DTE. (2012). Rencana Besar untuk Papua. No. 91–92. https://www.downtoearth-indonesia.org/node/953

Elisabeth, A. (2021). *Walhi: Hutan dan Masyarakat Adat Papua Terancam Proyek Food Estate*. Mongabay. Retrieved from https://www.mongabay.co.id/2021/08/03/walhi-hutan-dan-masyarakat-adat-papua-terancam-proyek-food-estate/

Elisabeth, A., & Hariandja, R. (2021). *Belasan izin kebun sawit di Papua Barat dicabut*. Mongabay. Retrieved from https://www.mongabay.co.id/2021/06/07/belasan-izin-kebun-sawit-di-papua-baratdicabut/#:~:text=Belasan%20Izin%20Kebun%20Sawit%20di%20Papua%20Barat%20Dicabutdi

Ginting, L., & Pye, O. (2011). Resisting agribusiness development: The Merauke integrated food and energy estate in West Papua, Indonesia. Paper presented at the International Conference on Global Land Grabbing 6–8 April 2011. In *The land deals politics Initiative (LDPI) in collaboration with the journal of peasant studies and hosted by the future agricultures consortium at the institute of development studies*. University of Sussex.

Harris, D. (2013). *Applied political economy analysis: A problem-driven framework*. ODI Politics and Governance.

KLHK. (2019). *Rekalkulasi penutupan lahan* Indonesia 2018.

Leftwich, A. (2007). *Drivers of change: Refining the analytical framework: A framework for political economy analysis*. DFID.

North, D. C. (1990). *Institutions, institutional change, and economic development*. Cambridge University Press.

Provincial Papua. (2013). Perda 23 of 2013 on Provincial Papua Spatial Plan for 2013–2033.

Pusaka. (2011). *MIFEE untuk siapa*. Retrieved from https://pusaka.or.id/2011/06/mifee-untuk-siapa/

Pusaka. (2020). *Apresiasi kebijakan Bupati Sorong terkait pencabuatan izin perusahaan perkebunan kelapa sawit*. Retrieved from https://pusaka.or.id/2020/08/apresiasi-kebijakan-bupati-sorong-terkait-pencabutan-izin-perusahaan-perkebunan-kelapa-sawit-pt-mega-mustika-plantation/

Resosudarmo, B. P. (2005). *Introduction: The politics and economics of Indonesia's natural resources*. Institute of Southeast Asian Studies.

Resosudarmo, B. P., Napitupulu, L., Manning, C., & Wanggai, V. (2009). Papua I: Challenges of economic development in an era if political and economic change. In B. P. Resosudarmo & F. Jotzo (Eds.), *Working with nature against poverty* (pp. 21–58). ISEAS.

Sembiring, R., Fatimah, I., & Widyaningsih, G. A. (2020). Indonesia's omnibus bill on job creation: A setback for environmental law? *Chinese Journal of Environmental Law, 4*(1), 97–109.

Serrat, O. (2011). *Political economy analysis for development effectiveness*. Asian Development Bank.

The Gecko Project. (2019). *Kesepakatan rahasia hancurkan surga Papua*. Retrieved from https://geckoproject.id/kesepakatan-rahasia-hancurkan-surga-papua-b347e51639fb

The Gecko Project & Mongabay. (2019a). *How land grabbers co-opt indigenous ritual traditions in Papua: Q&A with anthropologist Sophie Chao*. The Gecko Project & Mongabay. Retrieved from https://news.mongabay.com/2019/03/how-land-grabbers-co-opt-indigenous-ritual-traditions-in-papua-qa-with-anthropologist-sophie-marind/

The Gecko Project & Mongabay. (2019b). *Revealed: Government officials say permits for mega-plantation in Papua were falsified*. Retrived from https://news.mongabay.com/2019/12/revealed-government-officials-say-permits-for-mega-plantation-in-papua-were-falsified/

The Gecko Project & Mongabay. (2020a). *The consultant: Why did a palm oil conglomerate pay 22m to an unnamed 'expert' in Papua*. Retrieved from https://thegeckoproject.org/the-consultant-why-did-a-palm-oil-conglomerate-pay-22m-to-an-unnamed-expert-in-papua-edb486651342

The Gecko Project & Mongabay. (2020b). Pemain baru mulai babat hutan dalam proyek perkebunan sawit raksasa di Papua. Retrieved from https://geckoproject.id/pemain-baru-mulai-babat-hutan-dalam-proyek-perkebunan-sawit-raksasa-di-papua-39c8f4886d27

Unsworth, S., & Williams, G. (2011). *Using political economy analysis to improve EU development effectiveness*. A DEVCO Concept Paper.

West Papua province's Food, Horticulture and Plantation Crops Office. (2021). *Laporan Hasil Evaluasi Perizinan Perkebunan Kelapa Sawit Provinsi Papua Barat*. Retrieved from https://auriga.or.id/cms/uploads/pdf/related/4/6/laporan_hasil_evaluasi_perizinan_en.pdf

Widjojo, M. S., Elisabeth, A., Amiruddin, Pamungkas, C., & Dewi, R. (2008). *Papua road map: Negotiating the past, improving the present and securing the future*. ISEAS & LIPI, Yayasan Obor.

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Chapter 12
Environmental Governance as Knowledge Co-production: The Emergence of Permaculture Movements in Indonesia

Maharani Hapsari

Abstract Current academic debate witnessed the salience of looking at the epistemic dimension of environmental governance. In such setting, this study learns from how knowledge co-production works in the emergence of permaculture movements in Indonesia. The method of this study departs from the concept of knowledge co-production and situates it within the broader literatures on social movement and counter-hegemonic politics. The data is based on the experiences of four permaculture communities in Indonesia, namely Bumi Langit Institute, Sendalu Permaculture, IDEP Foundation, and Jiwa Damai. This study argues that the formation of permaculture movements in Indonesia involves negotiated boundaries among different ways of knowing in the epistemic relations surrounding permaculture practices. The critical distancing that develops between the movements and the hegemonic knowledge structure seeks to transform agro-industrial knowledge practices toward an alternative knowledge system. The quest of epistemic leadership is constructed through the porous boundaries of knowledge co-production toward defining what permaculture means as a collective project.

Keywords Knowledge co-production · Environmental governance · Hegemony · Permaculture · Social movements · Epistemic relation

12.1 Introduction

The importance of understanding the political dimensions of epistemic relations in environmental governance literatures is increasingly recognized (van der Molen, 2018; Lemos & Agrawal, 2006; Jasanoff, 2004a; Miller & Edwards, 2001). Environmental governance has mostly discussed about institutional framework that is authoritative to manage the process and consequences of environmental change

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for human society at multiple scales (Jasanoff & Martello, 2004; Lipschutz & Kütting, 2009). How environmental problems is known through different lens and regulated within specific knowledge schemes, however, often lacks attention.

Current environmental governance literatures have covered the question of knowledge production in two respects. The first strand of literature defines environmental governance as knowledge institutionalization. These literatures rely on the presumption of knowledge authority. The presence of expert and professional knowledge supports the methodological foundation of governance practices (Miller & Edwards, 2001). This power to know is central to the conditions of governing because knowledge is assumed to be concentrated in the presence of major institutions, mainly the government (Paavaola, 2007). Academic institutions are constitutive to such mechanism provided their truth-claim authority within the broad culture of scientific knowledge (Eicken et al., 2021). Knowledge dissemination works within the hierarchical structure in societal relations, between the knowledge producer and the knowledge receiver. Knowledge producer is often treated as having relative authority in the formation and internalization of particular rules. Such mechanisms also shape the relations of the knowledge producers and knowledge receivers that demands participation by the knowledge receivers to make the institutions legitimate (Paavaola, 2005). Likewise, this strand of literatures has also discussed some pathologies of institutional formation that accompany governance practices. This is related to the ability of the institutions to achieve particular normative goals given some institutional limits, such as lack of coordination, fragmentation of instruments and process, and substantive complexity. All these limits are considered affecting incentives that drive individual's choice or the consolidation of collective arrangements. Furthermore, it determines the ability of particular institutional arrangement to ensure coherence, centralization, and compliance (Chambers & Green, 2006).

The second strand of literature sees environmental governance as knowledge mobilization. It assumes that knowledge emerges in a decentralized manner, where there is no central authority that drives the formation of knowledge. Such claims can be situated within the broader critics of the core-periphery dichotomy (Hoppers, 2000) and the intellectual attempts to decolonize knowledge domination in the North-South relations (Grosfoguel, 2002). Such position argued for an area beyond the trickle-down and transfer model, which constitutes hybrid spaces in understanding knowledge relationship (Van Kerkhoff & Lebel, 2006). The making of environmental governance involves understanding situated ways of knowing and the particularity of problems facing human-ecology nexus (Collof et al., 2020; Ingram, 2017). In such a decentralized and plural setting, knowledge is produced scattered in various loci, and very often develops quite independently from each other as an epistemic undertaking. Such knowledge is mostly associated with the presence of civil society movements seeking to redefine the epistemic relations driven by state-centered knowledge practice (Ford, 2003). Knowledge travels and transcends various forms of life and navigates various locals. It also problematizes the generalization of science, which has often been treated as a dominant force in the process of legitimizing environmental governance (Bernauer & gampfer, 2013). The impacts of

knowledge production are examined not in terms of the scale of knowledge internalization and socialization, but in the way it is able to trigger individualized strategies of knowing without necessary leading to large-scale institutionalization. Critics on hegemonic modernity in a Latin American context illustrated how hybridity and heterogeneity are instrumental to the re-articulation of modern political power (Coletta & Raftopoulos, 2018). The contextualized aspect of knowledge, in this regard, is considered much more important than the aspiration toward an overarching knowledge framework that has universal character. The collaborative governance involves the use of the terms such as lay knowledge (Moran & Rau, 2016) and local knowledge in their interaction with positivist science, which contributes to the dynamics of knowledge mobilization (Grineski, 2006).

The existing literatures still provide rooms to elaborate the formation of knowledge that constructs environmental governance by considering the interactions between knowledge institutionalization and knowledge mobilization theses. This study, therefore, seeks to deepen the understanding of environmental governance departing from literatures on knowledge co-production, recognizing the dynamic interactions of knowledge institutionalization and knowledge mobilization, which characterize contemporary landscapes of environmental governance making. Knowledge co-production examines knowledge in its situated-ness against specific socio-political background. Furthermore, it examines the consequences of knowledge production beyond linear logic and very often the deterministic conceptual trajectory by looking at the dialectical aspects of knowledge production as co-constitutive processes. It also seeks to understand its tensions with the other evolving knowledge systems that seek to articulate their influence in the functioning of social order.

This study reflects upon the emergence of permaculture movements in transforming agro-industrial practices in Indonesia. Some questions that motivate this study are as follows: What are the limits of agro-industrial knowledge practices confronting contemporary social and environmental problems? In what ways have dialectical relations shape hegemonic knowledge and its altering forces? What does it take to advance knowledge co-production project in responding to socio-ecological limits of modern society? This study argues the limits of agro-industrial knowledge system as a common sense (Gramsci, 1971) are shaped by critical reflection of the epistemic beings around which socio-environmental problems are being identified. Multiple delineations of knowledge boundaries allow contestation over hegemonic knowledge through knowledge framing, practice, and knowledge enculturation.

To deliver the arguments, this chapter is divided into five sections. The first section elaborates a theoretical framework on the intersection of knowledge co-production and alter-knowledge that seek to transform the limits of hegemonic knowledge toward its normative trajectory. The second section discusses the research method and data analysis method. The third section elaborates the diverging perceptions of knowledge crisis internal to the hegemonic agro-industrial knowledge structure and the emerging foresights toward alternative ways of knowing. The fourth section elaborates the power dynamics of knowledge co-production in which permaculture movements seek to influence each other through their

knowledge practices as they seek common project. The fifth section discusses the implications of knowledge co-production and challenges to environmental governance project.

12.1.1 Knowledge Co-production and Alter-Knowledge: A Conceptualization

This study seeks to explore the question of environmental governance from the viewpoint of knowledge co-production. As knowledge is never neutral from power relations, it always represents a particular set of political standing upon which it justifies the way to respond to environmental problems and produces authoritative impacts. The methodological framework of this study incorporates the concept of knowledge co-production introduced by Sheila Jasanoff, critics of hegemony introduced by Antonio Gramsci (1971), and the theory of social movements by Alberto Melucci (1995). Knowledge co-production is an idiom that emphasizes the "social dimensions of cognitive commitments and understandings as well as the epistemic and material correlates of social formations" (Jasanoff, 2004, p. 3). The level of social aggregation and the kind of institutional spaces are formative to such co-production (Jasanoff, 2004, p. 5). Furthermore, knowledge co-production entails the stabilization of objects, the emergence of knowledge that becomes established among various competing knowledge, the formation of community of practice, and the presence of legitimate and meaningful cultural practices (Jasanoff, 2004, p. 5). Those elements are mutually constitutive shaping its authoritative effects in regulating the complex relations of human and their existence within the realm of nature as social construct.

Hegemonic knowledge is understood in this study as a product of knowledge co-production characterized with the commodification of the ecology, the separation of the economic realm from popular will, privatization of the public interest as well as the densification of transnational economic relations (Carroll, 2010). Hegemonic knowledge is composed of the diverse elements of state, local, and scientific knowledge. The relations among these elements most of the times are shaped by fractured construction rather than a well-consolidated structure. This creates a contingent power locus in which a transformative knowledge project is possible to pursue (Robbins, 2000).

The political aspect of knowledge production is situated within the broader framework of counter-hegemonic political struggle. Borrowing Gramsci, science and technology is integral in the production of common sense and unquestioned hegemonic knowledge practice (Gramsci, 1971). The normalization of science and technology has the affirmation effects toward public beliefs on what are considered as foundational matrices of the socio-ecological order. Gramscian view of hegemony emphasizes the everyday production of common sense that always involves tensions between class domination and the resistance of subaltern groups (Stoddart,

2007). The stabilization of certain epistemic position from the viewpoint of hegemony involves the coercive exercise of power as well as consent of the governed (Gramsci, 1971; Perkins, 2011, 2012). What sustains hegemonic knowledge is the ability of the knowledge structure and superstructure to orchestrate consent of the subaltern.

The rise of counter-hegemonic movement reflects the capacity of the dominated groups to build leadership, challenging the dominant class in alliance with other subjugated social elements (Andreucci, 2019). Changes within the knowledge structure are possible when the existing structure is unable to endure crisis internal to its epistemological limitations. The rise of organic intellectual, whose position is critical towards the re-conception of dominant knowledge practices (Meek, 2015), is central to the formation of an alternative knowledge system.

Embedded in the counter-hegemony is practice of opposition, yet counter-hegemony needs to be understood beyond romanticizing resistance. Practices of resistance may include behavior, action, and idea to undermine the material and symbolic components that legitimize the hegemonic structures. Counter-hegemony is concerned among others with the articulation of symbolic challenges and challenges to the distribution of material resources and the formation of a collective subject claiming for political power (Filc, 2021). Counter-hegemonic project seeks to destabilize the legitimacy and authority of the dominant order, involving the diversity of subordinate experience and resistances that is increasingly transnational, intersectional, and mediated in terms of how to reclaim the commons through programmatic actions and democratic forms of communication (Carroll, 2010).

The re-organization of knowledge by permaculture communities is assumed to come into being within the logic of conflict, solidarity, and system breaching (Melucci, 1995). These conflict and solidarity elements of social movements are formative to the mediation of knowledge co-production in the socially constituted relations. This study discusses the social convergence and divergence arising out of the permaculture movements. Knowledge co-production develops against the backdrop of particular political rationale. It also represents certain position in relation to the existing way of knowing, which can sustain, challenge or alter its elements. The emergence of permaculture movements in Indonesia is discussed as an indication of knowledge crisis associated with hegemonic knowledge practices that bear the effects of unabated social and environmental problems.

12.2 Research Method

This study employs the interpretive analysis to examine the experiences of four permaculture communities in Indonesia, namely Bumi Langit Institute in Yogyakarta, Sendalu Permaculture in West Java, and Indonesian Development of Education and Permaculture (IDEP Foundation) and Jiwa Damai, located in Bali.

Sendalu Permaculture was established in 2017 by Gibran Tragari, a university graduate practicing sustainable living in his resident in Depok, West Java Province.

Bumi Langit Institute was established in 2006 in Yogyakarta Special Region by Iskandar Waworuntu. It starts as family own land developed as permaculture learning center as well as community workshops attended by various domestic and foreign participants. IDEP Foundation is located in Bali Province. It was established following the Indonesian 1998 financial crisis, with the initial aim to strengthen self-sufficiency in providing food, shelter, energy and other needs of the local community throughout the economic recovery process. Jiwa Damai was established in 2010 by Margret Rueffler and is located in Badung, Bali Province. These communities present a converging commitment toward permaculture knowledge in their very diverse communal trajectories. The profile of each permaculture community is presented in Table 12.1.

These communities were chosen for their unique contribution to the diversity of counter-hegemony in Indonesia as practices of resistance and the way counter-hegemonic struggles are situated across different levels of political agency as a collective project. The selection was not merely on the basis of the scope of audience exposed to their political claims, but also on the substantive questioning of the dominant practices through both symbolic and material components of resistance at play.

Data collection is conducted through desk research including in-depth media coverage by various organizations with the founders and members of the respective permaculture communities. The materials for online data collection are gathered by consulting social media platforms and websites developed by each community and recent literatures covering selected communities as case study. The analysis identifies the construct of the hegemonic knowledge as interpreted by selected permaculture movements. It also defines how knowledge co-production emerges through the process of knowledge framing, knowledge practice, knowledge accumulation, and knowledge dissemination. The study further the fluid formation of knowledge boundaries as the movements seeks to advance their permaculture projects at both ideological and practical levels.

Table 12.1 Profile of selected permaculture communities in Indonesia

Community	Location	Core environmental values	Counter-hegemonic practices
Bumi Langit institute	Yogyakarta	Islamic-inspired environmentalism	Halal and thayib food production and consumption, permaculture training
Sendalu permaculture	Depok, West Java	Urban sustainable living	Sustainable and organic farming
IDEP Selaras Alam Foundation (IDEP Foundation)	Bali	Self-sufficiency in food, shelter, and energy provision for the local community	Counter-business model, permaculture education
Jiwa Damai	Bali	Inner-self ecological transformation and humanity	Vegan lifestyle, socially responsible organic gardening, retreat program

Source: Compiled by Author

12.2.1 Agro-industrial Knowledge and Its Contradictions

The expansion of agro-industrial knowledge has been a common sense in most industrializing societies. Industrial agriculture is seen as an integral part of modernization of agrarian society in Indonesia that delivers the needs of the population for foods, and provides job opportunities and access to commodity market for rural population. For government, economic growth driven by agricultural sector remains an important element of the national development strategy. This is particularly in the context of addressing poverty in the transition from primary to secondary to tertiary economic growth trajectories. This has also been inseparable from the exponential growth of the world population associated with demands of foods in its quantity and quality. The process is being normalized through the introduction of industrial technology, massive investment, the capacity of industrial employment, and the integration of university-supported research programs that give a way for the dissemination of agricultural innovation.

Along with such processes, there has been a long debate on the impacts of industrial agriculture on the society as well as on the relations of humans and agrarian livelihoods. Agricultural industrialization with its knowledge practice has changed the ecological landscapes and its social and environmental components massively (McCarthy & Zen, 2009; Pichler, 2015). Moreover, modern consumer food culture produces some problems such as unabated pollution from plastic materials for packaging, the use of chemical substance on the land, and debate around the consumption of genetically modified organism (Yngfalk, 2016). These have fostered initiatives around sustainable agriculture. Permaculture came as a growing alternative that is envisioned to provide another trajectory in response to the limits of industrial agriculture in sustaining the future ecological and social and economic bases of the population.

Growing involvement in the permaculture movement in response to shared perception of knowledge crisis is associated with the limits of industrial modes of production in the agricultural sector. There are three intertwined crises that are perceived by permaculture movements as challenges to agricultural modernization practices. This is related to how the connection of human and the ecosystem are being disrupted, how social relation is being reorganized, and how the individual capacity to cope with risks of vulnerability from industrial impacts is being challenged.

The first crisis is described as the dissociation of human from nature in which industrial society is superior to the natural system. In their public statements, permaculture communities under study shared similar views that the introduction of modern technology and massive land use and the use of non-organic materials gradually limit the regenerative capacity of land resources in supporting the future industrial needs. In responding to the immediate needs of land use, industrial agriculture is described as more inclined toward land expansion since the land resources regenerative and recovery capacity tends to go slower than the pressing needs to produce market commodities. In a larger scale, pressure to expand land use in various cases has also led to the gradual degradation of the soil and the displacement of

local communities in the establishment of mega projects. For Bumi Langit Institute, the alienation of human from nature has been accompanied by socially exploitative practices in the agricultural employment, environmental destruction, and other forms of social pathologies. This also appears as undesirable consequences of over-extraction and unmanaged disposal of agricultural material and resources throughout its production cycle (Waworuntu, 2017).

The second crisis is situated in the socio-cultural setting of agro-industrial society. Deeply ingrained consumer culture sustained by market dependence put the population as the consumers of industrial commodities. With the decreasing capability of the population to produce their own foods, the role of industrial agriculture in sustaining food consumerism is increasingly important (Tragari, 2020a, b). Some contradictions have appeared in this process. Food consumption, in particular, is not only a utilitarian practice. Cultural and religious values embraced by communities shape their beliefs on what is considered spiritually desirable living practices. For Bumi Langit Institute, consuming agro-industrial materials is believed to have profound impacts on the quality of individual spiritual and religiosity. Bad food consumption is argued to lead to poor health condition and negative social behaviors and it is against the religious principles (Waworuntu, 2017). Such cultural tension has been quite influential in driving more awareness of the impacts of industrial agriculture.

The third crisis is associated with the weakening of social ties and solidarity. In the view of Sendalu Permaculture, collectivity and communalism Indonesian culture has gradually diminished (Tragari, 2020a, b). Modern society with their individualistic character is believed to lose their social bonds in a way that disrupts the roots of solidarity. Industrial society is argued to have exacerbated the culture of individual pragmatism around consumer-oriented production. The gaps in the conditions of life of farmers, workers, and landowner also lead to deeper social inequality. There are also references to how workers have lived below the wage standard while being exposed to health risks and nutrition deficit in their everyday workplace (Waworuntu, 2017). Against such backdrop of crises, these four permaculture movements are seeking to transform human activities towards an alternative path that is more sustainable.

12.2.2 The Making of Epistemic Boundaries

The everyday practice of permaculture communities forms the delineation of epistemic boundaries. It centers on the emerging counter-discourse that allows the participants to create certain distance from knowledge practices that they are criticizing. It also involves deliberate claims through which permaculture movements construct an alternative definition of human relations to nature (particularly to land as the component of living system), active construction of collective sense of belonging through being parts of communities of practice, as well as the mutually constitutive elements of rules and consent among individual participants.

12.2.3 Redefining Human Relations to Nature

The formation of alternative to agro-industrial knowledge is informed by different sources of knowledge references these communities adhere to. For Bumi Langit Institute, such transformation must conform to the *sunnatullah* of Islamic teaching. Iskandar embrace Islamic teachings since the year of 2000, and built Bumi Langit based on Islamic teachings. The main reference is Al-Quran, especially its elaboration on *halalan thayyiban* behavior, including consumptions. It then further derives Islamic teachings on fairness, justice, and care for nature (Jaya, 2017). Bumi Langit Institute uses extensive scientific research to understand the impacts of non-organic agriculture on the human body. They also highlighted the benefit of food nutrition coming from traditional agriculture method to both physical and mental aspects of human and environmental health. Beyond short-term or technical remedy, knowledge practice is oriented toward structural transformation that embeds in the internalization of a sustainable way of living and changing lifestyle.

For Sendalu Permaculture, permaculture practices are ways to rebuild community engagement that is based on managing land and livelihood around solidarity, minimalism, and zero-waste lifestyle (Sjafari, 2019). The founder of Sendalu Permaculture mentioned the influence of a movie titled “Quite Revolution” and books by Michael Pollan such as “Second Nature”, “In Defense of Food”, “Second Nature”, “The Omnivore’s Dilemma”, and “The Botany of Desire” as some important references that shape the intellectual philosophy of the movement (Ramadhini, 2018).

Sendalu Permaculture shares its view with Bumi Langit Institute, which brings religious values, mainly Islamic values, into permaculture activities. Good food is associated with not only *halal* food, but is also food that meets the principle of *thayib* (does not engage in any actions that is socially and environmentally destructive, and sinful in the context of religious practice). The so-called Islamic ecology inspires these movements to be part of justice to nature and to the environment (Deviane, 2019). Bumi Langit counters the Western doctrines of “freedom” that advocate for individual choices because they suggest that in reality, “things do not become better”. They claim that the doctrine of freedom puts aside the nature rules that govern all mankind, letting greed takes over and violates nature’s law. Islam, on the other hand, gives rules that align with nature and governs the way human must act (Putro & Miyaura, 2020). Islamic teachings on Muslims’ daily lives, holistic sustainable practices, and scientific approach and claims on benefits of sustainable practices to human’s nutrition intake.

Jiwa Damai, meanwhile, focuses on the alignment of self-acceptance with natural metabolism of the earth. The re-identification of the self, furthermore, is a central process in balancing all the elements of human presence in their very broad cosmological space through self-healing, inner peace, self-love, and care for the Earth (Rueffler, 2014).

IDEP Foundation knowledge claims embrace the idea of humanity, respecting all forms of life (IDEP Foundation, 2021a, b, c). Knowledge project is dedicated

toward building community self-sufficiency and resilience in facing the risk of future crisis and disaster. Growing consciousness on the internal crises has contributed to shaping the practical method these communities introduce to their audience. IDEP Foundation engages explicitly with the dominant global development discourse, mainly the sustainable development goals (SDGs) promoted by the United Nations (Putro & Miyaura, 2020). In making their knowledge authoritative and legitimate, therefore, productive engagement with various articulations of environmental discourses is also witnessed as a co-constituting process. The organization makes an explicit reference to Code of Conduct established by the International Federation of Red Cross and Red Crescent Movement and Non-Governmental Humanitarian Organization (IDEP Code of Conduct, n.d). The Program Implementation Manual of the organization also states a reference to Hyogo Framework for Action (HFA) and Sendai Framework for Disaster Risk Reduction (SFDRR) (IDEP Foundation, 2021a, b, c). Multiple scales of knowledge references have played an important role in shaping the knowledge claims of these permaculture movements and later define their scope of knowledge engagement as they pursue particular and collective goals. In such context and with reflection to the experience of societies in other parts of the world, the question of knowledge institutionalization among the elements of environmental movements begs a thorough consideration. For some, institutionalization agenda often results in the state's cooptation and neutralization of a progressive agenda (Meek, 2015). The term institutionalization perhaps demands a re-articulation that it may accommodate the plea of collective agenda brought by counter-hegemonic forces through the so-called "war of position" (Gramsci, 1971), a projection of the long-term alliance building and ideological reform. Navigating through the institutional and mobilization aspects of knowledge co-production, therefore, shapes the political nuance of transformative projects brought about by permaculture movements in Indonesia.

12.2.4 Communities of Praxis

The individual and collective dimensions of knowledge system across permaculture communities are translated into various methods in managing the land-human relations as a system of life. Collective strategies have developed to stand distinctively from knowledge practices associated with agro-industrial methods. For the participants of the movements, permaculture is known as a terminology that can serve this purpose by delineating the traditional agricultural methods from those associated with the industrial. Such terminology is articulated in the development of organic farming method, the use of non-industrial fertilizers and substances, and the circular maintenance of local life materials. Other term that is also familiar among these communities is biological gardening, which is understood as a strategy to incorporate knowledge on microorganism for crop planting that will provide vegetables, fruits, and medicinal herbs. Such practice is also complemented by the minimum use of new materials and reliance on recycled and refurbished materials to develop

house construction and farms. Water and energy supply is provided through maximizing the natural cycle of annual rainfall and the use of solar panel and biogas for cooking. Efforts to minimize negative impacts of material use are also present in the form of waste separation, composting and reducing plastic consumption. The urban context, in which land availability is limited, permaculture techniques also adjust with maximizing the function of space.

Collective action is imbued with community-based values and social solidarity. The ecological sense of collectivity shapes the way the participants of the movement identify the implications of their agricultural practices. Collective practices are also informed by the materialization of permaculture in their very particular meaning for these different movements.

Jiwa Damai encourages vegan lifestyle as counter-practices to meet-based consumption, which they considered to increase pressure on land use and is not sustainable in the long term. Most of the activities conducted in these communities involve informal and interpersonal relations that allow participants to interact fluidly across diverse socio-cultural background and social status.

In Bumi Langit Institute, the emphasis on *halal* and *thayib* food consumption seems to represent the boundaries of practices. Knowledge practice, therefore, represents the changing paradigm which demands each individual to gradually distance from over-consumption and other activities that possibly lead to massive and unmanaged waste production (Waworuntu, 2017). For Sendalu Permaculture and IDEP Foundation, the alignment with sustainability values and organic farming method is the way these movements represent their position in relation to the hegemonic agro-industrial knowledge.

For permaculture communities in this study, agro-industrial practices as a hegemonic knowledge order center on the commercialization and commodification of land, labor and monetary resources, which is sustained through the internalization of consumer culture. There are ways to distant their everyday social practice from the monetization of agricultural practices, especially when it comes to managing the economic necessities of individuals and organizations involved. In their effort to sustain their activities in a longer term, these permaculture movements have approached the question economic livelihoods by relying on voluntarism, the involvement of individual donors and institutional partners to mobilize financial resources. As appears in their social media platforms, these communities received some amount of economic contributions in the form of class fees, donation, *awqaf, infaq, zakah,* and *shodaqoh*. Contributors share the benefits from circulating knowledge on permaculture and permaculture-related products to finance their ongoing activities.

Bumi Langit Institute opens a restaurant serving foods and beverages produced in their farm. They also sell honey, wheat bread, jam, herbal drinks, and other organic products to visitors. To make their products available through cooperative, they attended local organic market organized by their network communities and use social media to invite public participation. To support the staff, these communities also rely mostly on the voluntary in kind contribution and donation from the founders, colleagues, family members, volunteers, trainees, donors, and many other

affiliated individuals and communities. The collective contribution is also used to support partner communities who are within their network.

A more systematic financing is found in the case of IDEP Foundation. Since their programs are more institutionalized, there is a need to support the staffs, trainers, mentors, and other contributors through formal remuneration schemes. This affects how permaculture landscape is designed as a professionalized one in order to be able to produce a certain scale of economic activities (IDEP Foundation, 2021a, b, c). IDEP Foundation develops coconut plantation to produce organic products, such as Virgin Coconut Oil (VCO), dried coconuts, coconut snacks, and soaps (Putro & Miyaura, 2020). As a large foundation with an extensive network, IDEP has been able to establish a counter-business model through their critical engagement with various knowledge producers, be they government and non-government actors through providing permaculture trainings. These diverse strategies construe the everyday tension facing permaculture communities in reflecting upon the weaknesses of knowledge commodification.

12.2.5 Permaculture as the "New Common Sense"

Being parts of counter-hegemonic knowledge order, permaculture movements seek to fill the porous knowledge boundaries with their collective strategies. Individuals modify and make adjustment of their living practices, which connect them within the larger ideological-knowledge system. Permaculture communities engage in the active process of knowledge enculturation through individual practices, community networks as well as through community-government networks.

Sendalu Permaculture, Bumi Langit Institute, and Jiwa Damai pay attention more to the potential emancipation at the individual level. Knowledge dissemination by Sendalu is mostly targeted at strengthening the capacity of individuals to gain necessary technical skills in permaculture, mostly within the context of radical change experienced by the urban society.

In Bumi Langit Institute and Jiwa Damai, knowledge dissemination methods comprise live-in experience in which the individual participants make sense the scope and the depth of practical knowledge they are introduced to. Participants can stay for several days and interact with the local communities and get the sense of collectivity that inspires the movements. Bumi Langit uses the Islamic term d*akwah* to explain the process of knowledge dissemination within the network. They provide mosque and place to stay for people who want to learn Islamic lifestyle in a holistic and ecological manner (Jaya, 2017). In Jiwa Damai, outreach to individual volunteers is also made possible by internship programs, accommodating individuals from various social backgrounds and scientific disciplines (Rueffler, 2014). In addition to the on-site programs, all permaculture communities have also involved in the utilization of social media to reach out to broader audience in various localities. This is through the dissemination of information regarding their permaculture practices on digital platforms such as Youtube, Instagram, and organizational

websites. The way the social media framed the activities of these permaculture movements have also played an important role in connecting the movements with audience having diverse identities. Gibran Tragari has been framed by several media as a permaculture activist representing the alternative to mainstream urban millennial, who seek to be part of the urban culture as industrial workers. His practices are often categorized as part of the urban farmer culture that is increasingly popular among urban people in big cities in Indonesia (BeritaSatu, 2019).

Knowledge enculturation has become a political arena through which the permaculture movements act on behalf of the broader ecological constituents. Among four permaculture communities being studied, IDEP Foundation has the stronger engagement with knowledge in the government policy domain. They actively participate in policy dialogues and networking with various government representatives and international organizations. Permaculture knowledge is situated as part of the agenda of community resilience, which allows the co-production with actors at various policy domains. In 2018, IDEP Foundation collaborated with local government of Karakelang Island, Talaud Islands Regency, North Sulawesi, in the rehabilitation of coconut plantation (IDEP Foundation, 2018). This can be seen as an affect of multiple issues and multi-scalar scope of their knowledge project.

In all permaculture communities, knowledge enculturation develops through layers linking the closest communities (families, neighbors, and local residents surrounding the permaculture site) to the external affiliates where farmers, schools, local traders, partner institutions, government institutions, and international actors shape the direction of the movements. The relations of these permaculture communities with the government also to a certain extent present different implications to the direction of environmental governance as knowledge co-production.

12.3 Conclusion

This chapter has offered a reconceptualization of environmental governance as knowledge co-production, taking into account the salience of epistemic relations in the experience of four permaculture movements in Indonesia. It has shown that the knowledge boundaries developed across permaculture communities are porous, providing the space for dynamic knowledge exchange across binaries: local and global, religious and secular, formal and informal, institutional and non-institutional. Mobilization of individualized practices has contributed to the aggregation of collective knowledge in each community. It also provides spaces for knowledge co-production across these very diverse communities as they develop a sense of purpose in criticizing the hegemonic knowledge order. The interplay of individual and collective practices has actively transformed the movements as they struggle to define their collective epistemological boundaries. This has also shaped how individuals define their epistemic positions as part of the collective. Knowledge co-production can be explained as a way of taking a critical distance with hegemonic practice as a result of collective awareness of the internal crises. The tension between particular

and collective goals implicates toward the need of an epistemic leadership that can make permaculture as counter-hegemonic project stands on behalf of the largest political representations.

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References

Andreucci, D. (2019). Populism, emancipation, and environmental governance: Insights from Bolivia. *Annals of the American Association of Geographers, 109*(2), 624–633.
BeritaSatu. (2019, February 9). *People and inspiration: Gibran, Bertani Seturut Alam* [Video]. YouTube. https://www.youtube.com/watch?v=bSVudITk4lo
Bernauer, T., & gampfer, R. (2013). Effects of civil society involvement on popular legitimacy of global environmental governance. *Global Environmental Change, 23*(2), 439–449.
Carroll, W. K. (2010). Crisis, movements, counter-hegemony: In search of the new. *Interface, 2*(2), 168–198.
Chambers, W. B., & Green, J. F. (2006). *Reforming international environmental governance*. United Nations University Press.
Coletta, M., & Raftopoulos, M. (2018). Counter-hegemonic narratives and the politics of plurality: Problematizing global environmental governance from Latin America through the case of Bolivia. *Iberoamericana-Nordic Journal of Latin America and carribean Studies, 47*(1), 108–117.
Collof, M. J., Wise, R. M., Palomo, I., Lavorel, S., & Pascual, U. (2020). Nature's contribution to adaptation: Insights from examples of the transformation of socio-ecological systems. *Ecosystem and People, 16*(1), 137–150.
Deviane, A. (2019). Permaculture as an alternative way of living: The example of Bumi Langit in Indonesia. In *Research paper*. International Institute of Social Studies.
Eicken, H., Danielsen, F., Maru Sam, J., Fidel, M., Johnson, N., Poulsen, M.K., Lee, O.A., Spellman, K.V., Iversen, L., Pulsifier, P., & Enghoff, M . (2021). Connecting top-down and bottom-up approaches in environmental observing. Bioscience, 71(5), pp. 467–483.
Filc, D. (2021). Is resistance always counter-hegemonic? *Journal of Political Ideologies, 26*(1), 23–38.
Ford, L. H. (2003). Challenging global environmental governance: Social movement agency and global civil society. *Global Environmental Politics, 3*(2), 120–134.
Gramsci, A. (1971). In A. Gramsci, Q. Hoare, & G. N. Smith (Eds.), *Selections from the prison notebooks of*. International Publishers.
Grineski, S. E. (2006). Local struggles for environmental justice: Activating knowledge for change. *Journal of Poverty, 10*(3), 25–49.
Grosfoguel, R. (2002). Colonial difference, geopolitics of knowledge, and global coloniality in the modern/colonial capitalist world-system. *Review, 25*(3), 203–224.
Hoppers, A. A. O. (2000). The Centre-periphery in knowledge production in the twenty-first century. *Compare: A Journal of Comparative and International Education, 30*(3), 283–291.
IDEP Foundation. (2018). IDEP Annual Report 2018.
IDEP Foundation.(2021a). IDEP foundation official flyer.
IDEP Foundation. (2021b). Finance & administration manual.
IDEP Foundation. (2021c). Program implementation manual.
Ingram, J. (2017). Agricultural transition: Niche and regime knowledge system's boundary dynamics. *Environmental Innovation and Societal Transitions, 26*, 117–135.
Jasanoff, S. (2004). *States of knowledge: The co-production of science and social order*. Routledge.

Jasanoff, S., & Martello, M. L. (2004). *Earthly politics: Local and global in environmental governance*. The MIT Press.
Jaya, I. P. H. (2017). Da'wah culture: The way of Bumi Langit institute in popularizing Tayib lifestyle at Imogiri Bantul. *Karsa: Journal of Social and Islamic Culture*, 369–395.
Lemos, M., & Agrawal, A. (2006). Environmental governance. *Annual Review of Environment and Resources, 31*, 297–232.
Lipschutz, R. D., & Kütting, G. (2009). *Environmental governance: Power and knowledge in a local-global world*. Routledge.
McCarthy, J., & Zen, Z. (2009). Regulating the oil palm boom: Assessing the effectiveness of environmental governance approaches to agro-industrial pollution in Indonesia. *Law & Policy, 32*(1), 153–179.
Meek, D. (2015). Learning as territoriality: The political ecology of education in the Brazilian landless workers' movement. *The Journal of Peasant Studies., 42*(6), 1179–1200.
Melucci, A. (1995). The process of collective identity. In H. Johnston & B. Klandermans (Eds.), *Social movements and culture* (pp. 41–63). University of Minnesota Press.
Miller, C. A., & Edwards, P. N. (2001). *Changing the atmosphere: Expert knowledge and environmental governance*. The MIT Press.
Moran, L., & Rau, H. (2016). Mapping different concepts of sustainability: Lay knowledge, local practices and environmental governance. *The International Journal of Justice and Sustainability, 21*, 344–360.
Paavaola, J. (2005). *Environmental conflicts and institutions as conceptual cornerstone of environmental governance research*. CSERGE Working Paper EDM No. 05-01. University of East Anglia.
Paavaola, J. (2007). Institutions and environmental governance: A reconceptualization. *Ecological Economics, 63*(1), 93–103.
Perkins, H. A. (2011). Gramsci in green: Neoliberal hegemony through urban forestry and the potential for a political ecology of praxis. *Geoforum, 42*(5), 558–566.
Perkins, H. A. (2012). Consent to neoliberal hegemony through coercive urban environmental governance. *International Journal of Urban and Regional Research, 37*(1), 311–327.
Pichler, M. (2015). Legal dispossession: State strategies and selectivities in the expansion of Indonesian palm oil and agrofuel production. *Development and Change, 46*(3), 508–533.
Putro, R. H., & Miyaura, R. (2020). Indonesian permaculture: Factors shaping permaculture farm systems in humid tropical Indonesia. *Tropical Agriculture Development, 64*(3), 113–124.
Ramadhini, E. (2018, March 18). Berkebun, Sebuah Revolusi Sunyi. Warta Pilihan. Retrieved from https://wartapilihan.com/berkebun-sebuah-revolusi-sunyi/3/
Robbins, P. (2000). The practical politics of knowling: State environmental knowledge and local political economy. *Economic Grography, 76*(2), 126–144.
Rueffler, M. (2014, February 6). Lagu Damai Foundation + Jiwa Damai Organic Garden & Retreat Center [Video File]. Retrieved from https://www.youtube.com/watch?v=GJY8rgAC04o&t=123s
Sjafari, I. (2019, May 8). Gibran Tragari, Kemandiran Pangan Berkelanjutan. Majalah Peluang. Retrieved from http://majalahpeluang.com/gibran-tragari-kemandiran-pangan-berkelanjutan/
Stoddart, M. C. J. (2007). Ideology, hegemony, discourse: A critical review of theories of knowledge and power. *Social Thought and Research, 28*, 191–225.
Tragari, G. (2020a, January 21). Tentang Air dan Kota (Catatan Diskusi [C]Air 1). Retrieved from https://sendalupermaculture.wordpress.com/2020/01/21/tentang-air-dan-kota-catatan-diskusi-cair-1/
Tragari, G. (2020b, November 11). Kebun dan Kemandirian Pangan | Gibran Tragari [Video file]. Retrieved from https://www.youtube.com/watch?v=Vt18Gmmzz70
Van der Molen, F. (2018). How knowledge enables governance: The coproduction of environmental governance capacity. *Environmental Science & Policy, 87*, 18–25.
Van Kerkhoff, L., & Lebel, L. (2006). Linking knowledge and action for sustainable development. *Annual Review of Environment and Resources, 31*, 445–477.

Waworuntu, I. (2017). Pertanian Permaculture dan Nilai Islam – Bumi Langit Institute (SwaDesa) [Video File]. Retrieved from https://www.youtube.com/watch?v=Zo1Td5ENUnw

Yngfalk, C. (2016). Bio-politicizing consumption: Neo-liberal consumerism and disembodiment in the food marketplace. *Consumption Markets & Culture*, 275–295.

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Chapter 13
Aggregation and Representation in Knowledge Coproduction: Lesson Learned from the Indonesian Sustainable Palm Oil Scheme

Faris Salman and Akihisa Mori

Abstract A context-based approach and pluralism are often the main principles of knowledge coproduction (KCP), in addition to goal-oriented and interactive approach. To keep the original context and plurality from the knowledge source, knowledge in KCP can be bridged, scaled-up, or represented. Representation in KCP can distort results; however, it can also be beneficial especially for difficult-to-reach group members. Further, improving the structure of KCP can improve governance in instances where coproduced knowledge is used for governing processes. By conducting a case study of the Indonesian Sustainable Palm Oil (ISPO), this chapter explores how the representation of citizens affects coproduction and how it impacts environmental governance in Indonesia. We utilize the principles of KCP for sustainability and the operationalization of knowledge for improving governance. We found that government-dominated development and implementation should be shifted to networked public participation to reconcile conflicting objectives of social acceptance. To improve public participation, non-government actors can play key representing roles in making the process more collaborative, and bridging and aggregating knowledge produced by stakeholders with diverse interests. Initial establishment of the ISPO endorsed the government's predetermined agenda and suffered operationalization problem. The shift from government-dominated development and implementation to a networked and public KCP facilitated ISPO policy strengthening. The networked, public KCP formed stages where knowledge is aggregated and bridged to a higher tier of discussion through representation. Our result also provided insight that representation in KCP may not be avoided in certain situations, such as with time and economic cost constraint. The network used for KCP can benefit environmental governance, as it helps government-dominated governance incorporate civil society.

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13.1 Introduction

One of the goals of utilizing coproduced knowledge in governance is to enable governance that produces necessary knowledge to support sustainability and the social dynamics to act on governance processes (Miller & Wyborn, 2020). The governance processes may be affected by knowledge and power imbalances that affect the construction of new goals and objectives. Successful knowledge coproduction is context-based, pluralistic, goal-oriented, and interactive (Norström et al., 2020). In addition, frequent and sustained engagement with knowledge stakeholders—especially indigenous stakeholders—is a salient principle in the KCP literature (Zurba et al., 2021). However, when discussing KCP, it is necessary to pay attention to indigenous representation and indigenous knowledge integration (Latulippe & Klenk, 2020; Norström et al., 2020). Past views of knowledge in KCP are sometimes extractional, separating the knowledge from the context (Latulippe & Klenk, 2020). Successful KCP tries to avoid using indigenous knowledge as "data" by putting indigenous knowledge and actor *in* the process (Latulippe & Klenk, 2020; Maclean et al., 2021).

Past research on KCP and environmental governance commonly emphasizes bottom-up approaches. The guiding principles of KCP start at a low level. For example, various small sets of issues define the contexts of KCP or disaggregated indigenous knowledge as sources of knowledge (Indrawan & Sofjan, 2021; Zurba et al., 2021). Specific knowledge or context often requires bridging for KCP to occur, and for coproduced knowledge to be used for better governance (Florin & Lindhult, 2015; Howlett & Ramesh, 2016; Norström et al., 2020). This bridge can be boundary works, organizations (Clark et al., 2016; Zurba et al., 2019), or boundary objects (Rathwell et al., 2015). However, it is possible for coproduced knowledge to be the boundary object (Zurba et al., 2021). Coproduced knowledge can also be "scaled-up" through nested levels (e.g., governance levels), such as in polycentric governance (Jordan et al., 2018; Wyborn et al., 2019), and can solve some environmental governance issues (Jordan et al., 2018).

However, a lack of proper operationalization capacity brings about governance failure that can hollow out the ability to enforce regulations (Howlett & Ramesh, 2016). Improving governance hierarchy through effective operationalization is one way to improve governance capacity (Howlett & Ramesh, 2016). Moreover, if coproduced knowledge is to be used to improve governance, it requires effective operationalization (Howlett & Ramesh, 2016; Sorrentino et al., 2018).

Indonesian Sustainable Palm Oil is seen as a method for overcoming the existing cost, stringent challenges, and limitations associated with the Roundtable on

Sustainable Palm Oil (RSPO) certification. The development of ISPO policy suits the less stringent and emerging palm oil market in Global South (Higgins & Richards, 2019; Ruysschaert & Salles, 2014). Indonesian palm oil governance is still considered less stringent compared to RSPO. It also has a weak administrative structure and is constrained by performance issues, such as low compliance from private actors and lacking coordination across different levels of governments (Higgins & Richards, 2019; Pacheco et al., 2018a; Schouten & Bitzer, 2015). The weak structure hollows out standard enforcement and coordination (Astari & Lovett, 2019; Hidayat et al., 2018; Putri et al., 2022). The Indonesian government recently improved the ISPO regulations by establishing Presidential Decree No. 44/2020 (Choiruzzad et al., 2021). This presidential decree has a higher governmental authority than the previous minister's regulations, and covers multiple government agencies on both the national and local levels. It aims to increase the acceptance and competitiveness of Indonesian palm oil products in national and international markets (Choiruzzad et al., 2021). Four years after the deployment of the ISPO, 127 out of 763 plantations in Indonesia obtained ISPO certification. None of these plantations were smallholders. After the implementation of additional regulations complementing ISPO, including the presidential decree, the number of certified plantations increased to 494. Fourteen of them are palm oil smallholder cooperatives (Lestari, 2021).

A policy paper is one of the mandatory requirements for proposing a regulatory draft as an official regulation in Indonesia. To draft the policy paper, various stakeholders were invited and to participate in Focused Group Discussion (FGD), SWOT analysis, and workshops on palm oil plantation that were conducted and managed by the Indonesian Ministry of Planning (Bappenas). The policy paper document was the final product of the FGD, SWOT, and workshops.

Against this backdrop, this chapter aims to investigate how the representation of citizens affects coproduction (Cepiku & Giordano, 2014; Latulippe & Klenk, 2020), and impacts environmental governance in Indonesia, taking ISPO as a case. In doing so, we examine the policy paper (*naskah kebijakan*) that formed part of the basis for establishing the ISPO as a state regulation. Specifically, we examine how this policy paper was made, who was involved (Montana, 2019), and how the policy paper formation and actors involved impacted the environmental governance process, especially ISPO governance. To analyze this policy paper, we utilize the principles for successful KCP (Norström et al., 2020). Our analysis suggests that government-dominated development and implementation should be shifted to public participation to reconcile conflicting objectives of social acceptance. To increase public participation, non-government actors can play key representing roles in making the process more collaborative, and bridging and aggregating knowledge produced by stakeholders with diverse interests.

13.2 Theoretical Argument: Representation in Coproduction, Operationalization, and Governance

13.2.1 Representation in Knowledge Coproduction

We define KCP as the "iterative and collaborative processes involving diverse types of expertise, knowledge and actors to produce context-specific knowledge and pathways toward a sustainable future" (Norström et al., 2020). KCP is ideal to pursue inclusivity to produce knowledge benefitting the knowledge producers because it allows diverse type of expertise, knowledge, and actors (Latulippe & Klenk, 2020;Norström et al., 2020 ; Zurba et al., 2021). This chapter uses representation as a flat relation "between KCP participants and those outside of the process" (Montana, 2019). Developing countries often display a flat relation for representation in KCP.

Incorporating representation into KCP can help involve difficult-to-reach group members. However, the involvement strongly depends on whom they represent and how similar they are with the target group (Eriksson, 2019). Representation in KCP also appears in the form of chosen members from external communities, as participation in KCP is selective while diverse (Cepiku & Giordano, 2014; Montana, 2019). In such situations, the representation strongly depends on the selection process and criteria (Cepiku & Giordano, 2014). The selection process is vulnerable to manipulation by powerful actors, such as selection criteria (Montana, 2019). Representation in KCP enables the utilization of knowledge from networked members outside of the group (Eriksson, 2019; Montana, 2019).

Government can act as a resourceful actor for KCP, allowing multi-stakeholder interaction (Sorrentino et al., 2018). There are several contextual differences that differentiate coproduction in developing countries. A coproduction evolves into a partnership with many stakeholders (including global institutions). Moreover, coproductions are launched by donors and lack coordination (Cepiku & Giordano, 2014). Undertaking a coproduction in the ideal way can also present technical barriers such as high economic cost and time consuming (Oliver et al., 2019). On the other hand, coproduction enhances diversity (Norström et al., 2020), frequent and sustained engagement, shared understanding, and stakeholder empowerment (Zurba et al., 2021). While representation in coproduction can harm the quality of a coproduction (Latulippe & Klenk, 2020), representation may be necessary for inclusiveness (Cepiku & Giordano, 2014).

13.2.2 KCP and Knowledge Operationalization for Improving Governance

Cultivating trust, capacity, and knowledge flows among diverse actors conforms to the concepts of pluralism and interactivity in coproducing high-quality knowledge for sustainability (Norström et al., 2020; Zurba et al., 2021). Achieving pluralism

necessitates the involvement of multiple actors across various sectors and backgrounds to generate knowledge products and develop shared perspectives and understandings. The interactive coproduction process involves frequent interactions among participants, including designing the process and jointly using and disseminating generated knowledge. In addition, an active capture and engagement with civil society (e.g., through a series of dialogs) can facilitate inclusive multi-stakeholders' discussions on KCP processes (Indrawan & Sofjan, 2021).

The coproduction process involves multiple stakeholders cooperating and aiming to formulate shared perspectives and understandings; it bridges problems, benefits stakeholders, and promotes shared responsibility (Florin & Lindhult, 2015; Habermas, 1990; McCulloch, 2015). It facilitates flexible and adjustable "sustainable practices" and improves compliance (Higgins & Richards, 2019). This holds especially where coproduced knowledge is situated in a particular context and is designed to be goal-oriented (Norström et al., 2020). The contexts of coproduction processes can be place-based.

However, this context must be restricted to a defined set of issues that intersect with the unique needs and interests of different stakeholder groups. The effect of choosing an appropriate context is reflected in whose problems are being solved or priorities whose being addressed. Determining a goal (ranging from short-term to long-term goals) in coproduction depends on how the goal is shared, understood, and agreed upon collectively.

Coproduced knowledge requires operationalization to improve governance. Successful KCP can cover the analytical, managerial, and—to some extent—political competencies. That is, improving policy capacity in analytical competences can be done by having better knowledge of policy substances, better institutions, and opportunities for knowledge generation. Managerial competencies can benefit from robust coordinated actions between stakeholders and engaging policy networks. Political competencies can be improved through understanding of the needs of different stakeholders, inter-organizational trust, and two-way communication with non-state actors (Howlett & Ramesh, 2016). As improvement in policy capacity intersects with the practice of successful KCP, the generation of coproduced knowledge can impact policy capacity and governance. In addition, effective administrative structures, processes, coordination, and political support are keys to effective operationalization (Sorrentino et al., 2018).

13.3 Methodology

13.3.1 Case Selection

A recent study on the palm oil governance complex explored major gaps in capacity, cooperation, compliance, and credibility of the governance of the palm oil sector (Pacheco et al., 2018a). These gaps accrue to the existing problems affecting the palm oil governance complex, such as the relatively uneven allocation of resources,

access to land, resources, and markets; uneven power distribution among palm oil stakeholders, and environmental landscapes; decentralized and opaque decision-making processes combined with intertwined interest; and land allocation transparency. In addition, Indonesian palm oil governance suffers from ineffective governance at the local and regional levels due to persistent structural challenges (Putri et al., 2022).

The regulatory side of palm oil governance analyzed the environmental governance that focuses on the Indonesian government (Putri et al., 2022) and other stakeholders involved in the palm oil value chain (such as plantation owners, farmers, civil societies, and civil society organizations, etc.) (Pacheco et al., 2018b). Changes to stakeholder interactions through KCP and operationalization of coproduced knowledge by the government are associated with the change in the performance of governance.

13.3.2 Methodology

We explored why the ISPO is underperforming and how the governance of ISPO has been improved. A case study is a relevant method for exploring "how" question and when the observation has no control over behavioral events (Yin, 2017). We used the establishment of the ISPO as a case study and treated the implementation of ISPO regulation as a policy action resulting from KCP for governance (Table 13.1). We analyzed the Bappenas policy paper used for ISPO regulation as a form of

Table 13.1 Application of the principles of knowledge coproduction in sustainability research (Norström et al., 2020) in Indonesian Sustainable Palm Oil (ISPO) case study

Principles	Explanation	Application in ISPO case
Context-based	Coproduction process situated in an embedded context of particular problems and challenges	Coproduction process to improve palm oil governance and solve relevant environmental problems around palm oil production in Indonesia
Pluralistic	Involvement of academics (from various disciplines) and stakeholders from other sectors (government, business, civil society, and local and indigenous community) to generate an enriched understanding of the problem	Involvement of academics, government (regional and local level), plantation managers, smallholder farmers, and civil society members to achieve a shared understanding of environmental problems surrounding palm oil production
Goal-oriented	Develop a collective understanding among all participants and agreed-upon measures of success	Develop agreed-upon measures and milestones to govern Indonesian palm oil production and navigate current environmental problems
Interactive	Frequent interactions among participants throughout the process, from framing and research to using and disseminating the generated knowledge	Stakeholders actively engage and interact through repeated conversations or events to create, use, and disseminate coproduced knowledge

Source: Author interpretation

coproduced knowledge using principles of a successful sustainability research (Norström et al., 2020).

We conducted an interview with members of the Indonesian Biodiversity Foundation (KEHATI) on February 23, 2022. The KEHATI Foundation is leading the Strengthening Palm Oil Sustainability (SPOS) Indonesia program. To guide the interview, we use open-ended questions about involved actors, actor's roles and contributions, and knowledge assembly process. The questions are: (1) Were the participants and stakeholders invited or elected to contribute to the policy paper and public consultation? How was this initiated, and how were the processes carried out?; (2) How was the process of summarizing policy papers and public consultation results carried out?; and (3) How were the public consultation, workshops, and FGD was scheduled? How were they executed?

We also searched for news articles related to ISPO and palm oil to support this case study. We used the Lexis Database to browse news articles containing keywords "ISPO" and "kelapa sawit" (oil palm). We used the Indonesian language because the ISPO is a regulation specific to Indonesia, and such terms should provide more information about the case. We narrowed our search to news articles published between January 1, 2010 and December 31, 2020, to cover news articles related to changes in ISPO policy. Specifically, we focused on news articles covering the process of KCP as well as actors' and stakeholders' responses to changes in ISPO regulations.[1] In total, we found 17 news articles. In analyzing the case study, we also used additional sources such as scientific publications and other supporting documents from gray literature, such as reports and media briefings.

13.4 The ISPO as Coproduced Knowledge and Sustainable Governance

The ISPO is an environmental governance tool that was initiated by a ministerial decree in 2011; subsequently, it was refined in 2015 and strengthened in 2020 (Putri et al., 2022). It is known that the ISPO is a regulatory tool created in response to RSPO certification (Wijaya & Glasbergen, 2016), an act of authority claims from private sustainability standards such as RSPO (Higgins & Richards, 2019; Schouten & Bitzer, 2015), or a measure to complement private sustainability standards (Pacheco et al., 2018b). The ISPO was created after the Indonesian government carried out a "watch and see" strategy and participated in RSPO activities to provide technical and regulatory expertise for creating national interpretation of RSPO for industries and smallholders (Wijaya & Glasbergen, 2016). This involvement provided state actors with sufficient information about sustainability standards and

[1] From the interview we conducted, we learned that there are three main government regulations regarding ISPO: Minister of Agriculture Decree No. 19/Permentan/OT.140/3/2011, Minister of Agriculture Decree No. 11/Permentan/OT.140/3/2015, Presidential Decree No. 44/2020.

certification procedures and established a state regulation for sustainable palm oil (Wijaya & Glasbergen, 2016).

13.4.1 The ISPO as Coproduced Knowledge

The ministerial decree[2] mandates that regulation, established under the agricultural ministry, such as the ISPO, must accompany the regulation draft alongside i) a policy paper, ii) a digital copy of the regulation draft, iii) minutes of the internal discussion on the draft and a list of attendees, and iv) minutes of public discussion on the draft and a list of attendees. The policy paper and public discussion involve public stakeholders, including farmers and agricultural businesses (Wijaya & Glasbergen, 2016). The policy paper includes a literature study and is the product of multi-stakeholder interactions, including FGD, discussions, and seminars. The procedure for creating the policy paper is in-line with KCP requirements, as it involves diverse actors trying to address challenges and influences actions that can contribute to sustainability (Norström et al., 2020; Zurba et al., 2021).

13.4.2 The Context of ISPO Creation

The process of the ISPO regulatory draft began from four general issues surrounding Indonesian palm oil industries: technology, economy, social aspects of local farmers, and the environment. While each issue involves different stakeholder constellations, the main stakeholders include smallholder plantations and private plantations or palm oil manufacturers.

The issues listed in the policy paper (Table 13.2) encompass a variety of stakeholders and were generated from an interpretation of studies used in the policy paper. Most of the contexts in the problem mentioned in the policy paper were related to domestic development or certain issues. For example, regarding technological issues, the productivity gap between smallholder plantations on the one hand and private and government plantations on the other came from an earlier study (Roesdiana, 2009) and data from the Statistics Indonesia (BPS, 2009). Added-value opportunities were derived from interpreting the ratio of the exported amount of crude palm oil (CPO) export versus CPO derivatives and the types of derivatives. Regarding economic and social problems, low productivity issues were related to other factors, such as aging plants, limited access to capital and resources, and market structure. For environmental issues, the report reinforced the findings of a previous study (Teoh, 2010) regarding the palm oil plantations' relationship to

[2] Minister of Agriculture Decree No. 25/Permentan/OT.010/7/2017 about Procedures for Establishing Laws and Regulations within the Ministry of Agriculture.

Table 13.2 List of issues related to sustainable palm oil development in the policy paper supporting Indonesian Sustainable Palm Oil (ISPO) creation

	Related stakeholders	Issues
Issue categories		
Technology	Smallholders and private plantation	Productivity gap between smallholders and private plantations
		Lack of industries downstream from crude palm oil and opportunities of added value
Economy	Smallholders, private plantations, NGOs, and roundtable on sustainable palm Oil (RSPO)	Low productivity at smallholder plantations due to aging and intensification difficulties related to capital and resources
		International competition with other vegetable oil producers and related international NGOs promoting RSPO
Social aspects of local farmers	Smallholders, private plantations, funding institutions (banks), and palm oil association	Land use, land use rights, and land ownership conflicts among smallholder plantations
		Institutional barriers preventing smallholders from accessing funding and market information
Environment	Smallholders, private plantations, and local governments	Deforestation, climate change, and biodiversity loss
		Concession management and politics
		Information transparency problems leading to conflicts

Source: Author's interpretation of policy paper document (Bappenas, 2010)

deforestation and biodiversity loss as well as its impact on climate change. Some RSPO-certified plantations are considered to have fewer environmental problems than non-certified plantations. Additionally, the policy paper acknowledged the possibility that deforestation can occur due to procedural problems, such as contradictions of regulations related to converting forest land into land for other uses (Nurrochmat et al., 2020; Putri et al., 2022).

In contrast to nationally focused issues in technology, and the social aspects of farmers, economic issues of Indonesian palm oil pay attention to both national and international context, that is competition among other vegetable oils. From approximately 2005–2007, exports of CPO and refined palm oil to the European market increased due to an increased demand for biodiesel, decreasing local vegetable oil production (such as rapeseed oil and sunflower oil, which are substitutes to palm oil), and for palm oil in the food industry (Rifin, 2010a). Simultaneously, the Indonesian government planned to build a large-scale palm oil plantation. The establishment would have potentially displaced 1.8 million ha of forest ("Palm oil exports", 2009). However, the plan was abandoned after considering the geographic location and soil conditions. Nevertheless, the plans had already been made public, and in response, nongovernmental organizations (NGOs) launched environmental

campaigns against the establishment. The news coverage and campaigns negatively affected the competitiveness of the Indonesian palm oil market (Rifin, 2010a). Reflecting on this decreasing competitiveness, the policy paper argued that since palm oil productivity is higher than that of soybean and rapeseed, tariffs should not be imposed to improve its international competitiveness (Pratiwi, 2021; Rifin, 2010b).

In short, according to the policy paper, the contexts of ISPO creation are decreasing international competitiveness, low productivity for farmers with limited access to funding and seeds, the productivity gap between plantations and smallholders, and forest conversion.

13.4.3 The Goal of ISPO Creation

The policy paper states that the ISPO aimed to increase Indonesian palm oil competitiveness and its value-added sustainably. This direction came from the previous policy suggestions contained in the *Oil Palm Road Map* published in 2009 and 2010 (Road Map *Kelapa Sawit*). The roadmaps dealt with the application of technology to palm oil cultivation and palm oil production and its derivatives. However, such attention to cultivation and production technology may not align well with recent changes in international markets that have affected Indonesian palm oil exports.

The policy paper suggested attaching the attribute of “sustainable” to Indonesian palm oil products through certification. Incorporating sustainability certification into government regulation discussed about the state’s environmental problem, how to promote Indonesian palm oil as sustainable product, and advocate for the application of the RSPO principle and criteria. A scheme similar to RSPO could generate economic, social, and environmental benefits. This scheme should be the new strategy for incorporating sustainability through policy alternatives (Table 13.2) as an added value, and it should lead the global palm oil market.

13.4.4 The Plurality of ISPO Creation

When the paper dealt with identifying policy alternatives to support the predetermined goal, multi-stakeholder involvement was visible. Bappenas proposed eight policy alternatives (Table 13.3), summarized from government-held workshops on Strategic Environmental Studies (KLHS) and FGD. There were no lists of workshops or mentions of FGD attendees in the policy report. External stakeholders then ranked the eight policy alternatives according to their alignment with Indonesian palm oil development goals.

The invited stakeholders—including government bureaus (Bappenas and Directorate General for Plantation), a state university (IPB University), a state research body (Riset Perkebunan Nusantara), a palm oil producers association (GAPKI), and social and environmental NGOs—are considered important

Table 13.3 List of policy alternatives supporting Indonesian Sustainable Palm Oil (ISPO) and its rank

Policy alternatives	Rank
Development of downstream industries and added values for palm oil	1
Transparency regarding palm oil plantation establishment information	2
Promotion, advocation, and public campaigning for the palm oil industry	3
Supporting RSPO principles and criteria	4
Development of a conflict resolution mechanism	5
Improving smallholders' access to information and funding	5
Strengthening and enforcing the ISPO and concession licensing management	6
Control the conversion of forest and peat land into palm oil land	7

Source: Bappenas (2010)

stakeholders in the state's palm oil production. While the policy paper did not specify specific companies, news outlets mentioned several large plantations, such as Government Palm Oil Plantations (PT Perkebunan Nusantara), Subsidiaries of SMART (SinarMas Group, Multinational), Sime Darby (Multinational), Astra Agro Lestari (Indonesia), Wilmar (Multinational), and Sampoerna (Indonesia). Large plantations were also involved in the ISPO field testing (Wijaya & Glasbergen, 2016). Further, it is unknown whether smallholder farmers were involved, or which NGOs were invited.

Several issues related to multi-stakeholder involvement, especially those involving smallholders, were identified: conflict resolution mechanisms, access to information and funding, and focusing on increasing palm oil products from smallholders. Access to funding was centered on subsidies or lowering the interest rate for the replanting and rejuvenation processes. Improvement in information access was discussed in terms of providing technical or organizational assistance to palm oil cultivators. The policy paper discussed a general approach for conflict resolution, such as public consultation. Previous research found that this approach did not facilitate balanced negotiations between stakeholders (Hidayat et al., 2018).

13.4.5 The Interactions during ISPO Creation

The development of the ISPO consisted of discussions (strategic environmental assessments and KLHS workshops), pilot tests, FGDs, and finalization (Wijaya & Glasbergen, 2016; Bappenas, 2010). KLHS workshops are a law-mandated activity[3] that includes the participation of all relevant stakeholders. The pilot test included

[3] Indonesian Law No. 23/2009 about Protection and Environmental Management.

interactions between independent auditors, the government, and palm oil companies (Wijaya & Glasbergen, 2016), while FGD served as a platform for creating policy alternatives and ranking them. There are no records of other interactions between stakeholders in the policy paper.

13.4.6 *Operationalization of ISPO for Environmental Governance*

The lack of operational capability of the state in mobilizing the ISPO is reflected in the small number of certifications. Four years after the deployment of ISPO, 127 out of 763 plantations obtained the ISPO certificate. None of them were smallholders. Recently, two additional regulations were added to complement ISPO: the Decree of Ministry of Agriculture No. 11/2015 and No. 38/2020. These regulations helped increase the number of certified plantations to 494. Among them, 14 were palm oil smallholder cooperatives (Lestari, 2021).

The small number of certifications accrued to two factors. First, it was deemed mandatory for select categories of palm oil establishments when the ISPO was established as a state regulation (Putri et al., 2022) (R. Suprapto, personal communication, February 23, 2022). Second, the ISPO is ambiguous, confuses actors, and inhibits coordinated actions (Choiruzzad et al., 2021).

This implies that the problem of operationalization is not necessarily related to the knowledge produced but the operational capabilities of the knowledge produced, namely the regulation infrastructure and palm oil industrial structure in Indonesia (Hidayat et al., 2018; Putri et al., 2022). As a governance platform, the ISPO also has weak vertical coordination capacity, such as local government autonomy benefitted the local government's interest instead of local oil palm farmers (Hidayat et al., 2018). During the deployment of the ISPO, the lack of governmental resources hampered certification processes. Local governments had difficulties to access ISPO-certified plantations. The ISPO commission also did not have enough authority to enforce sanctions. Due to past decentralization policies, the authority instead belonged to local governments (either the governor, regents, or city mayor). Last, those in the European market doubted the credibility of the ISPO.

13.4.7 *Increasing Public Participation in Strengthening the ISPO Policy: Public Consultations for Presidential Decree No. 44/2020*

In a letter from Coordinating Ministry for Economic Affairs, letter number 54/2016, the Indonesian government established a strengthening team for the ISPO certification system. This team was comprised of members of government agencies (e.g.,

representatives from the Ministry of Agriculture, Ministry of Environment and Forestry, and Coordinating Ministry for Economic Affairs), and NGOs (e.g., ISPO Alliance [ASLI], KEHATI Foundation, Kaoem Telapak, and Sustainable Palm Oil Development Forum). The invited non-governmental team members had participated in previous cooperative initiatives with government agencies at the national, regional, and local levels. These organizations also had experience in managing public consultations in the past (I. Bakhtiar, personal communication, February 23, 2022).

The strengthening team was tasked with proposing a policy suggestion for strengthening the ISPO certification system and drafting a presidential decree. Public consultations focusing on palm oil-producing regions (Central Kalimantan, Riau, Sulawesi, and West Papua) were conducted to obtain feedback from the public on the ISPO certification system (Bakhtiar et al., 2018). Public consultation sessions were arranged with the cooperation of NGOs (ASLI, Kaoem Telapak, and Independent Forest Monitoring Network), utilizing their existing social networks and infrastructure. Feedback from public consultations was obtained in writing and collected by the cooperating NGOs; subsequently, it was used as discussion material to improve the regulation draft. In improving the draft, members of the strengthening team discussed the contents and context of the public feedback before finalizing it. One of the major changes to the regulations was the inclusion of civil society in the ISPO committee, through the establishment of Presidential Decree No. 44/2020 (I. Bakhtiar, personal communication, February 23, 2022).

While the program to strengthen the ISPO certification system was initiated by the Indonesian government, it developed into a part of a program from UKCCU and KEHATI Foundation (SPOS Indonesia). One of the main focuses was to obtain ground-level data on smallholder palm oil farmers and plantations, especially in terms of mapping and registration. The data obtained during this project contributed to creating government regulations, one of which was Presidential Decree No. 44/2020 (R. Suprapto, personal communication, February 23, 2022). However, there were limitations regarding the public consultations. To save money and time, the areas had to be grouped into regions, and public consultations were held once in each respective region. Additional efforts, such as obtaining public feedback through an online form, did not attract input (I. Bakhtiar, personal communication, February 23, 2022).

13.4.8 Public Participation in Knowledge Coproduction: Lesson Learned from ISPO

Our case study of KCP regarding the ISPO gives two implications. First, government-dominated development and implementation should be shifted to networked public participation to reconcile conflicting objectives of social acceptance. The ISPO scheme was a process dominated by the government or government bureaus meant

to advance the state's predetermined agenda of promoting Indonesian palm oil products. However, in response to increasing criticism from scholars (Hidayat et al., 2018; Pacheco 2018a, b) and NGOs (Nanggara et al., 2017), the government decided to strengthen the ISPO policy to "increase the acceptance and competitiveness of Indonesian palm oil products in national and international markets" (Choiruzzad et al., 2021). One of these efforts was to increase public participation during the drafting and public consultation stages. Our findings differ from previous studies in that the representative was an organization representing an aggregation of groups of individuals. This constitutes another non-traditional form of interaction in KCP (Sorrentino et al., 2018).

Second, non-government actors can play key representing roles in making the process more collaborative, and bridging and aggregating knowledge produced by stakeholders with diverse interests. Technology can be used to overcome spatial barriers related to coproduction processes in Indonesia (Indrawan & Sofjan, 2021). However, in our case, the online questionnaire did not attract much input; instead, it had to rely on social network. Even after creating local spaces for public consultation, representation is still required for cost and other practical reasons. The aggregated knowledge from the public consultation sessions was bridged to a higher tier of dialog by NGOs. Furthermore, our interview results suggested that representation by NGOs plays a vital role in coproduction, and it plays a particularly important role in avoiding extraction and misrepresentation (Latulippe & Klenk, 2020).

Our case also demonstrated that representation is necessary for improving the feasibility of public participation. This is particularly true when considering the spatial scale, time required, and costs of ISPO public consultation. Further, this means increasing the participation NGOs at various levels of governance, from local to the national level. The network used to elicit public participation may also contribute to environmental governance.

Nonetheless, external actors may not be always politically neutral nor powerful enough to represent stakeholders in diverse interests, coproduce knowledge and improve environmental governance. In the case of ISPO, the non-state actors have enough investments in the form of social network and experience working with government in past projects. These factors made them likely to be chosen as partner in increasing public participation. In addition, the involvement of foreign institution (UKCCU) also contributed to governance improvement (Cepiku & Giordano, 2014).

13.5 Conclusion

This chapter explored the ISPO as a form of coproduced knowledge in governing Indonesian palm oil to achieve sustainability. We asked how the representation of citizens affects coproduction and impacts environmental governance. First, we found that government-dominated development and implementation should be shifted to networked public participation to reconcile conflicting objectives of social acceptance. In addition to the existing operationalization problem, the ISPO was a

form of knowledge that endorses the government's predetermined agenda. The government-dominant contribution combined with low operationalization explained the performance problem prior to the ISPO regulation strengthening initiative. There were plans to improve the governance of the ISPO by increasing its degree of authority from ministerial decree to presidential decree. In doing so, government-initiated civil participation is included in the regulation. Public consultation marked a shift from government-dominated development and implementation to a networked, public KCP through strengthening the ISPO initiatives. Second, non-government actors can play key representing roles in making the process more collaborative, and bridging and aggregating knowledge produced by stakeholders with diverse interests. Representation created stages where aggregated knowledge from public consultations needed to be bridged to a higher tier of discussion. We expect that the network used to engage public participation and aggregate knowledge can benefit from environmental governance.

We have yet to discuss whether representation distorts represented knowledge or shifts power constellations. There were also some questions left unanswered. For example, we did not answer why some online public consultations succeeded and others failed. This might have to do with the target audience, time required, or infrastructure availability. In Indonesia, palm oil smallholders and plantations are often located in remote areas with limited internet access. These are vital considerations, especially when dealing with unexpected events, such as the COVID-19 pandemic.

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Notes

Lists of news articles used from Lexis Nexis news database:

Publisher	Publication date	Title
Antara	October 28, 2010	ISPO diprioritaskan bagi perkebunan sawit besar
Antara	November 9, 2010	Indonesia siapkan ISPO untuk panduan perkebunan sawit
Koran tempo	November 14, 2010	Menteri Pertanian perjuangan agar standar sawit Indonesia diakui dunia
Koran tempo	November 14, 2010	Persyaratan RSPO dinilai tak adil bagi Indonesia
Antara	December 10, 2010	Indonesia akan berlakukan ISPO dalam perdagangan CPO
Antara	January 21, 2011	ISPO siap diberlakukan pada tahun ini
Koran tempo	January 24, 2011	PTPN III siap ISPO tahun ini
Antara	February 4, 2011	Pengusaha harapkan penerapan ISPO sebelum 2014
Antara	February 4, 2011	GAPKI minta biaya ISPO di bawah RSPO

(continued)

Publisher	Publication date	Title
Antara	February 9, 2011	Pemerintah fasilitasi penerapan ISPO
Antara	March 29, 2011	Standar minyak sawit lestari Indonesia dicanangkan Rabu
Antara	March 20, 2014	Lahan sawit tersertifikasi ISPO 378 ribu ha
Antara	December 10, 2014	Kementan dorong industri sawit lakukan sertifikasi
Antara	November 22, 2015	Menuju standar lebih tinggi sawit berkelanjutan
Antara	April 9, 2017	GAPKI: Sertifikasi ISPO bersifat wajib
Tempo	July 16, 2020	Pemerintah percepat sertifikasi ISPO Lahan kelapa sawit
Koran tempo	September 22, 2021	Capaian minim sertifikasi Lahan sawit

References

[Bappenas]. (2010). National Development Planning Agency of Indonesia Badan Perencanaan Pembangunan Nasional. 2010. *Naskah Kebijakan (Policy Paper) Kebijakan dan Strategi dalam Meningkatkan Nilai Tambah dan Daya Saing Kelapa Sawit Indonesia Secara Berkelanjutan dan Berkeadilan* [Policy Paper: Policy and strategy for sustainable and equitable Indonesian palm oil in increasing added value and competitiveness]. Bappenas.

[BPS]. (2009). Statistics Indonesia Badan Pusat Statistik. In *Statistik Perdagangan Luar Negeri Indonesia – Ekspor*. Badan Pusat Statistik.

Astari, A. J., & Lovett, J. C. (2019). Does the rise of transnational governance "hollow-out" the state? Discourse analysis of the mandatory Indonesian sustainable palm oil policy. *World Devevelopment, 117*, 1–12. https://doi.org/10.1016/j.worlddev.2018.12.012

Bakhtiar, I., Suradiredja, D., Santoso, H., Sanjaya, A., & Saif, I. (2018). *Sawit Rakyat: Pemetaan kerangka kebijakan, kondisi nyata, dan aksi lapangan*. [Smallholder palm oil: mapping, policy framework, field verification, and reality]. KEHATI Foundation.

Cepiku, D., & Giordano, F. (2014). Co-production in developing countries: Insights from the community health workers experience. *Public Management Review, 16*(3), 317–340.

Choiruzzad, S. A. B., Tyson, A., & Varkkey, H. (2021). The ambiguities of Indonesian sustainable palm oil certification: Internal incoherence, governance rescaling and state transformation. *Asia Europe Journal*, 1–20.

Clark, W. C., van Kerkhoff, L., Lebel, L., & Gallopin, G. C. (2016). Crafting usable knowledge for sustainable development. *Proceedings of the National Academy of Sciences of the United States of America, 113*(17), 4570–4578.

Eriksson, E. M. (2019). Representative co-production: Broadening the scope of the public service logic. *Public Management Review, 21*(2), 291–314.

Florin, U., & Lindhult, E. (2015). Norms and Ethics: Prerequisites for Excellence in Co-production. *Högskola Och Samhälle I Samverkan HSŚ15, 28* May 2015*, Kalmar, Sweden*. https://www.diva-portal.org/smash/record.jsf?pid=diva2:1010093

Habermas, J. (1990). Discourse ethics: Notes on a program of philosophical justification. In J. Habermas (Ed.), *Moral consciousness and communicative action* (p. 43). MIT Press. https://play.google.com/store/books/details?id=fmYjgiUMy7EC

Hidayat, N. K., Offermans, A., & Glasbergen, P. (2018). Sustainable palm oil as a public responsibility? On the governance capacity of Indonesian Standard for Sustainable Palm Oil (ISPO). *Agriculture and Human Values, 35*(1), 223–242. https://doi.org/10.1007/s10460-017-9816-6

Higgins, V., & Richards, C. (2019). Framing sustainability: Alternative standards schemes for sustainable palm oil and South-South trade. *Journal of Rural Studies, 65*, 126–134. https://doi.org/10.1016/j.jrurstud.2018.11.001

Howlett, M., & Ramesh, M. (2016). Achilles' heels of governance: Critical capacity deficits and their role in governance failures. *Regulation & Governance, 10*(4), 301–313. https://doi.org/10.1111/rego.12091

Indrawan, M., & Sofjan, D. (2021). Co-production of knowledge and transformative learning towards a sustainable Asia. *APN Science Bulletin, 11*(1), 125–133.

Jordan, A., Huitema, D., van Asselt, H., & Forster, J. (Eds.). (2018). *Governing climate change*. Cambridge University Press.

Latulippe, N., & Klenk, N. (2020). Making room and moving over: Knowledge co-production, indigenous knowledge sovereignty and the politics of global environmental change decision-making. *Current Opinion in Environmental Sustainability, 42*, 7–14. https://doi.org/10.1016/j.cosust.2019.10.010

Lestari, R. (2021, October 17). Tahun Ini, 139 Perkebunan Sawit Terima Sertifikat ISPO [This year, 139 palm oil plantations obtained ISPO certificate]. *Bisnis.com*. https://ekonomi.bisnis.com/read/20210922/99/1445447/tahun-ini-139-perkebunan-sawit-terima-sertifikat-ispo

Maclean, K., Woodward, E., Jarvis, D., Turpin, G., Rowland, D., & Rist, P. (2021). Decolonising knowledge co-production: Examining the role of positionality and partnerships to support indigenous-led bush product enterprises in northern Australia. *Sustainability Science, 17*, 333–350. https://doi.org/10.1007/s11625-021-00973-4

McCulloch, T. (2015). Beyond compliance: Participation, co-production and change in justice sanctions. *European Journal of Probation, 7*(1), 40–57. https://doi.org/10.1177/2066220315575669

Miller, C. A., & Wyborn, C. (2020). Co-production in global sustainability: Histories and theories. *Environmental Science & Policy, 113*, 88–95. https://doi.org/10.1016/j.envsci.2018.01.016

Montana, J. (2019). Co-production in action: Perceiving power in the organisational dimensions of a global biodiversity expert process. *Sustainability Science, 14*(6), 1581–1591. https://doi.org/10.1007/s11625-019-00669-w

Nanggara, S. G., Rosalina, L., Kartika, R. Y., & Setyawan, A. A. (2017). *Enam Tahun ISPO: Kajian terkait penguatan instrumen ISPO dalam merespon dampak-dampak negatif seperti deforestasi, kerusakan ekosistem gambut, kebakaran hutan dan lahan, serta konflik tenurial* [Six years of ISPO: a study of strengthening ISPO instruments to respond to negative impacts, deforestation, deteriorating peat ecosystem, land and forest fire, and tenurial conflict] (C. Purba & A. Ruwindrijarto, Eds.). Forest Watch Indonesia.

Norström, A. V., Cvitanovic, C., Löf, M. F., West, S., Wyborn, C., Balvanera, P., Bednarek, A. T., Bennett, E. M., Biggs, R., de Bremond, A., Campbell, B. M., Canadell, J. G., Carpenter, S. R., Folke, C., Fulton, E. A., Gaffney, O., Gelcich, S., Jouffray, J.-B., Leach, M., et al. (2020). Principles for knowledge co-production in sustainability research. *Nature Sustainability, 3*(3), 182–190. https://doi.org/10.1038/s41893-019-0448-2

Nurrochmat, D. R., Boer, R., Ardiansyah, M., Immanuel, G., & Purwawangsa, H. (2020). Policy forum: Reconciling palm oil targets and reduced deforestation: Landswap and agrarian reform in Indonesia. *Forest Policy and Economics, 119*(102291), 102291.

Oliver, K., Kothari, A., & Mays, N. (2019). The dark side of coproduction: Do the costs outweigh the benefits for health research? *Health Research Policy and Systems, 17*(1), 33.

Pacheco, P., Levang, P., Dermawan, A., & Schoneveld, G. (2018a). The palm oil governance complex: Progress, problems and gaps. In *Achieving sustainable cultivation of oil palm volume 1: Introduction, breeding and cultivation techniques*. Burleigh Dodds.

Pacheco, P., Schoneveld, G., Dermawan, A., Komarudin, H., & Djama, M. (2018b). Governing sustainable palm oil supply: Disconnects, complementarities, and antagonisms between state regulations and private standards. *Regulation & Governance, 14*, 568–598. https://doi.org/10.1111/rego.12220

Palm oil exports at risk from overseas buyers boycott. (2009, May 18). *The Jakarta Post*. https://www.thejakartapost.com/news/2009/05/18/palm-oil-exports-risk-overseas-buyers-boycott.html

Pratiwi, I. (2021). The predictors of Indonesia's palm oil export competitiveness: A gravity model approach. *Journal of Intercultural Studies, 14*(3), 250–262.

Putri, E. I. K., Dharmawan, A. H., Hospes, O., Yulian, B. E., Amalia, R., Mardiyaningsih, D. I., Kinseng, R. A., Tonny, F., Pramudya, E. P., Rahmadian, F., & Suradiredja, D. Y. (2022). The oil palm governance: Challenges of sustainability policy in Indonesia. *Sustainability: Science Practice and Policy, 14*(3), 1820. https://doi.org/10.3390/su14031820

Rathwell, K. J., Armitage, D., & Berkes, F. (2015). Bridging knowledge systems to enhance governance of environmental commons: A typology of settings. *International Journal of the Commons, 9*(2), 851. https://doi.org/10.18352/ijc.584

Rifin, A. (2010a). Export competitiveness of Indonesia's palm oil product. *Trends in Agriculture Economics, 3*(1), 1–18. https://doi.org/10.3923/tae.2010.1.18

Rifin, A. (2010b). The effect of export tax on Indonesia's crude palm oil (CPO) export competitiveness. *ASEAN Economic Bulletin, 27*(2), 173–184.

Roseesdiana. (2009). "*Sustainable production in Indonesia*". Presentation at the China International Oil and Oilseeds Summit 2009, 8–10 July 2009

Ruysschaert, D., & Salles, D. (2014). Towards global voluntary standards: Questioning the effectiveness in attaining conservation goals: The case of the Roundtable on Sustainable Palm Oil (RSPO). *Ecological Economics: The Journal of the International Society for Ecological Economics, 107*, 438–446. https://doi.org/10.1016/j.ecolecon.2014.09.016

Schouten, G., & Bitzer, V. (2015). The emergence of Southern standards in agricultural value chains: A new trend in sustainability governance? *Ecological Economics: The Journal of the International Society for Ecological Economics, 120*, 175–184. https://doi.org/10.1016/j.ecolecon.2015.10.017

Sorrentino, M., Sicilia, M., & Howlett, M. (2018). Understanding co-production as a new public governance tool. *Policy and Society, 37*(3), 277–293. https://doi.org/10.1080/14494035.2018.1521676

Teoh, C. H. (2010). *Key sustainability issues in the palm oil sector*. International Finance Corporation.

Wijaya, A., & Glasbergen, P. (2016). Toward a new scenario in agricultural sustainability certification? The response of the Indonesian National Government to Private Certification. *Journal of Environment & Development, 25*(2), 219–246. https://doi.org/10.1177/1070496516640857

Wyborn, C., Datta, A., Montana, J., Ryan, M., Leith, P., Chaffin, B., Miller, C., & van Kerkhoff, L. (2019). Co-producing sustainability: Reordering the governance of science, policy, and practice. *Annual Review of Environment and Resources, 44*(1), 319–346. https://doi.org/10.1146/annurev-environ-101718-033103

Yin, R. K. (2017). *Case study research and applications: Design and methods*. SAGE Publications.

Zurba, M., Maclean, K., Woodward, E., & Islam, D. (2019). Amplifying indigenous community participation in place-based research through boundary work. *Progress in Human Geography, 43*(6), 1020–1043. https://doi.org/10.1177/0309132518807758

Zurba, M., Petriello, M. A., Madge, C., McCarney, P., Bishop, B., McBeth, S., Denniston, M., Bodwitch, H., & Bailey, M. (2021). Learning from knowledge co-production research and practice in the twenty-first century: Global lessons and what they mean for collaborative research in Nunatsiavut. *Sustainability Science, 17*, 449–467. https://doi.org/10.1007/s11625-021-00996-x

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Part IV
Urban

Chapter 14
The Conceptual Models of Dynamic Governance Toward Sustainable Urban Water Management in Metropolitan Area

Wahyu Mulyana, Eko Prasojo, Emirhadi Suganda, and Setyo Sarwanto Moersidik

Abstract Water is a key resource needed for human life. Urban water supply has not met the target of fulfilling water rights in terms of quantity, quality, continuity, and affordability. Urban water management system still traditionally emphasizes the physical construction of infrastructure and are still managed fragmented. This research aims to develop the conceptual models of dynamic governance model in urban water governance. The research approach uses a qualitative method by using soft system methodology (SSM) to develop the conceptual model. Research results are the conceptual models of dynamic governance in urban water governance at the policy hierarchy process starting from policy, organizational and operational levels to achieve the goals of sustainable urban water management. The conceptual models are described through the pathways of activities based on the interaction between dynamic capabilities and organizational culture. The dynamic governance model is adapted in Bandung Metropolitan Area as an implementation strategy in the fast-growing urban area.

Keywords Post-politicization · Environmental disasters · Local government · Democratic regression · Oligarchic policing

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14.1 Introduction

14.1.1 Context

Urbanization and urban population growth has accelerated the socio-economic development of a country, but at the same time it has increased environmental problems both on a global and local scale (e.g., see Ichimura, 2003; Zhao et al., 2006; Marcotullio & Solecki, 2010). Water is a key resource needed by humans to sustain life and build community welfare (WHO, 2012). The life of urban communities requires the availability of sufficient water in terms of quantity, quality, continuity, and affordability.

Water need continues to increase along with the increase in the world's population, even though the amount of water available on earth is relatively constant and its quality is even decreasing (Hatmoko et al., 2013). Urbanization has an impact on changes in the water cycle as indicated by the increasing demand for water, reduced evapotranspiration and water infiltration, poor water runoff, and increased waste disposal (McGrane, 2016). Urban water resources continue to be under pressure due to the changes in land use, environmental pollution and climate change pose a threat to water security to meet human needs, risk of water-related disasters, and the decline of urban ecosystem functions (Pahl-Wostl et al., 2012).

Many experts argue that the water crisis in urban areas is caused by governance failures (e.g., see UNDP, 2006: Nababan, 2012; Gupta et al., 2013). Urban water cycle starting from surface water, ground water, drinking water, and wastewater is handled separately by various institutions according to their respective duties and authorities. The current urban water management still uses a traditional approach that relies on the construction of physical infrastructure networks and causes adverse economic and environmental impacts (Mitchell, 2006; Briony et al., 2013).

In a rapid changing world and full of uncertainty, there is no one who can guarantee that a current development success will continue in the future (Kasim, 2015). It is believed that the current urban water management will not be able to meet the needs and challenges of future development that are increasingly dynamic due to the changes of global political-economic, the decreasing environmental quality, and the increasing climate change impact. In order to anticipate and respond to these rapid changes, a more dynamic, flexible, and responsive urban governance system is needed. Dynamic governance is an approach used in public policy process in the midst of an ever-changing and uncertain situation (Neo & Chen, 2007). Dynamic refers to the characteristics of actors and institutions that always have new ideas, able to act quickly, adaptive, innovative, and have the ability to learn and execute policies effectively.

14.1.2 The Objective

This chapter aims at two main objectives. First is to develop the conceptual models of dynamic governance in urban water management in the metropolitan area using a soft system methodology. Second is to adapt the conceptual models of dynamic

governance in sustainable urban water management in the Bandung Metropolitan Area as a fast-growing metropolitan area in Indonesia. The novelty in this article is to combine dynamic governance concepts and models in the policy hierarchy process from the policy, organizational and operational levels to achieve sustainable urban water management.

14.1.3 Structure of the Chapter

The chapter is divided into several sections: after the introduction, the second section examines the literature reviews including a brief description of sustainable urban water management, dynamic governance concept and policy hierarchical process, and a brief profile of the Bandung Metropolitan Area. The third section presents the results of the analysis and discussion. The final section is the conclusion.

14.2 Methods

This research was carried out using a qualitative method to develop a conceptual model of dynamic governance in urban water management at the policy, organizational and operational levels. The analytical tool used is the soft system methodology (SSM), a method used to structure thinking in complex situations based on the results of in-depth interviews (Checkland & Scholes, 1990). In-depth interviews were conducted with key informants representing groups of actors involved in the public policy process for urban water management, namely: non-government executive actors, government executive actors, and non-government actors. The adaptation of the dynamic governance model into sustainable urban water management in the Bandung Metropolitan Area is carried out using a strategic planning approach to outline the stages and strategic steps to achieve sustainable urban water management.

There are seven stages carried out in the analysis using SSM. The first stage is to describe a complex and unstructured problem situation in urban water management based on desk studies and exploration of various data and information as well as in-depth interviews with problem owners. In the second stage, the researcher created a rich picture to describe the complexity of urban water governance issues at the policy, organizational, and operational levels. The third stage is to define the root definition in developing a system that is relevant to the problem situation using the CATWOE (Customer, Actors, Transformation, World View, Ownership, and Environment) checklist. This checklist uses the six mentioned elements to explore the system where the problem took place. In the fourth stage, the researcher constructs a conceptual model based on the results of problem identification on the policy hierarchy process at the policy, organizational, and operational levels. The fifth stage compares the conceptual model with real-world problem situations. In the sixth stage, researchers make improvements to the conceptual model. The

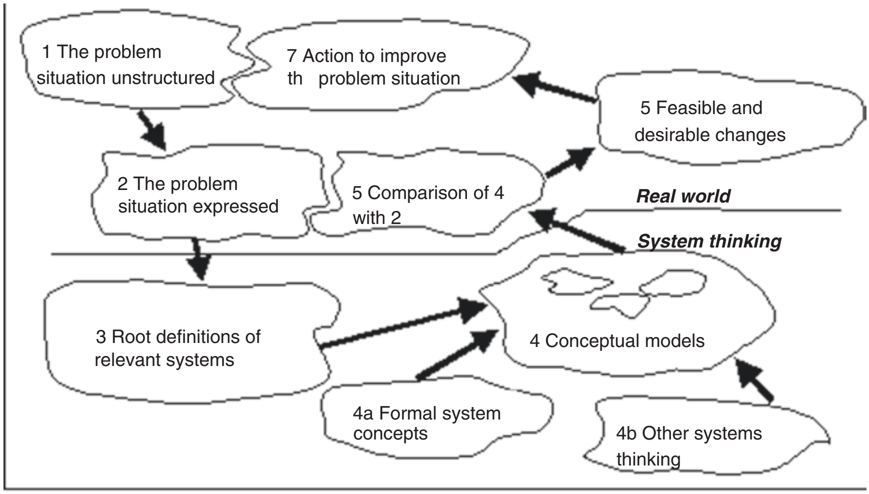


Fig. 14.1 Stages of soft system methodology. (Source: Checkland & Scholes, 1990)

seventh stage is the implementation of the action. The seventh stage was not carried out in this research because it takes a long time and is not measurable to complete. The stages of SSM are summarized in Fig. 14.1.

14.3 Literature Review

14.3.1 Sustainable Urban Water Management

The urban water cycle is a series of activities in the use of water starting from taking water sources, processing raw water and processing drinking water, and reusing wastewater into raw water sources (Dijk, 2012; Monfort et al., 2014). The development of urban areas affects the urban water cycle and the surrounding area (Molinos-Senante & Sala-Garrido, 2016). Urban socio-economic activities have an impact on taking groundwater and surface water sources, covering the ground surface and preventing groundwater recharge, increasing the risk of flooding and pollution of water bodies due to unmanaged waste. In addition, the impacts of climate change increase climate variability and extreme climate events that affect urban water availability (de Oliveira et al., 2015).

Urban water management still uses the traditional approach emphasizing the provision of physical infrastructure that is managed separately and supported by capital-intensive investments. Traditional urban water management will not be able to cope with the pressures and changes that occur due to rapid urbanization, environmental changes, economic activities, and the impacts of climate change (Marlow et al., 2013). Much of the literature discusses the importance of changing traditional approaches to more environmentally, socially, and economically sustainable urban

water management (Pahl-Wostl, 2007; Brown et al., 2009; Alegre et al., 2012). Sustainable water management is defined as a strategy to conserve future water resources, increase water availability and manage clean water to ensure sustainability for current and future generations (Ding & Gosh, 2017).

Sustainable urban water management has been discussed since the 2000s together with the implementation of local agenda for sustainable development or Agenda 21. Several concepts that address sustainable urban water management include: Integrated Urban Water Management (Biswas, 2004; Maheepala et al., 2010; Burn et al., 2012), Total Water Cycle Management (Water by Design, 2010), Water Sensitive Urban Design (Wong & Brown, 2009), Low Impact Development (Clar et al., 1998), and Sponge City (Wang et al., 2017). Each concept uses a variety of meanings, but has the same basic principles adopted.

Unlike the conventional hydrological management, the IUWM includes urban area as a critical element for the catchment areas and provides opportunities to integrate with non-urban sectors. IUWM is a new approach where water supply, sanitation, storm water, and wastewater are managed in an integrated manner with land use planning and economic development (Furlong et al., 2016). Total water cycle management (TWCM) is a comprehensive water cycle management approach including wastewater recycling, wastewater treatment, and rainwater capture (Chanan & Woods, 2006). Water sensitive city (WSC) is a concept to create a livable and resilient city uniting sustainable urban drainage systems or green infrastructure with water recycling schemes (Brown et al., 2009). The water cycle is managed in a holistic and integrated manner through a transitional scheme starting from drinking water supply, sewerage, drainage, and environmental protection. Low impact development (LID) is an approach to wastewater management that is carried out naturally through land development technology (Clar et al., 1998; Table 14.1).

Table 14.1 Comparison of SUWM characteristics

Integrated urban water management	Water sensitive city
1. Encourage participation of all stakeholders. 2. Taking into account non-urban users. 3. Integrate water storage, distribution, treatment, recycling, and disposal. 4. Match the quality with the use of water. 5. Recognize the relationship between water, land use, and energy. 6. Include alternative water sources. 7. Recognize and seek alignment of formal and informal institutions. 8. Protect, conserve, and extract water resources at source. 9. Pursuing efficiency, equity, and sustainability.	1. Stakeholders, both communities and institutions are effectively involved in urban water planning and decision-making. 2. All parts of the urban water cycle, natural and built are managed in a holistic and integrated manner in order to protect ecological health, using a diverse and flexible infrastructure. 3. A long-term strategic approach is taken in developing policies, plans, and programs. 4. Inter-disciplinary approach. 5. Local context is considered, including environmental, social, economic, political, and institutional.

Source: Bahri (2012) and Brown et al. (2009)

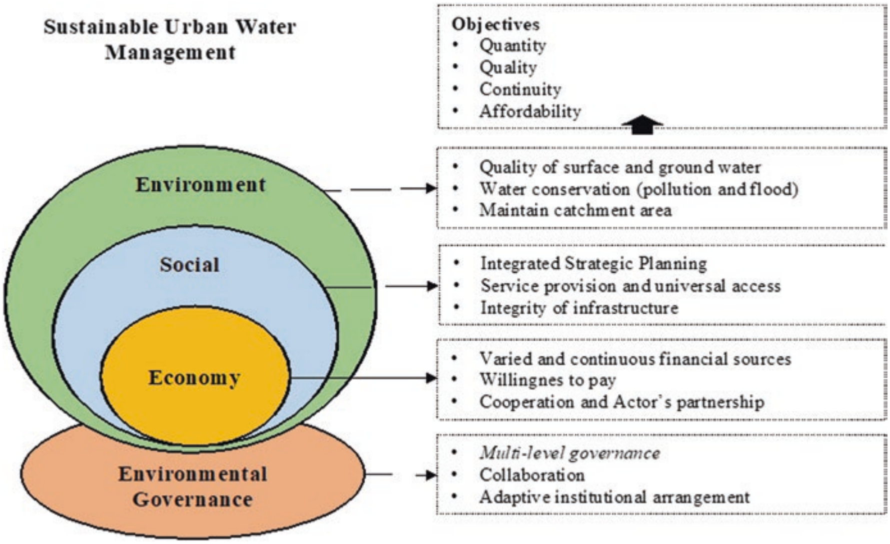


Fig. 14.2 The framework of sustainable urban water management. (Source: Analysis, 2018)

Based on the above concepts and approaches to urban water management, the basic principles in sustainable urban water management include: (a) encouraging stakeholder participation in planning and decision-making processes, (b) integrating urban water cycle management both across sectors and between urban and non-urban areas, (c) applying a long-term strategic approach through policies, plans, and programs, (d) applying an interdisciplinary approach and the relationship between water, land use, and energy, (e) taking into account the local context and sustainability includes aspects of environmental conservation, social equality, economic efficiency, political and institutional interests, both formal and informal (Wong & Brown, 2009; Bahri, 2012). The framework for sustainable urban water management that can be developed based on the above principles can be seen in Fig. 14.2.

14.3.2 Dynamic Governance

It is increasingly recognized that efforts to achieve sustainable development are part of the governance challenge (Redclift, 2005). Governance is an enabling condition for achieving sustainable development goals. The challenges faced by urban development are increasingly complex, requiring a more flexible, anticipatory, and responsive governance system so that they are able to adapt and cope with the changes. Many governance theories are used to explain the ability to respond to changes including dynamic governance (Neo & Chen, 2007) and adaptive governance (Folke et al., 2005).

The concept of dynamic governance is widely discussed in the literature on organizational science, strategic management, and public policy. The main source of reference is the concept of dynamic governance which has been successfully applied by government organizations in implementing policies, plans, programs, and actions for public services in Singapore. In environmental governance regimes, the concept of dynamic governance is known as adaptive governance as a new approach to natural resource management to respond to the complexities and uncertainties of the changing global environment (Chaffin et al., 2014).

Dynamic governance is the result of the interaction between capability and organizational culture to develop adaptive policy pathways so that change and continuous learning occur as well as the ability to execute policies effectively to overcome emerging challenges and problems (see Fig. 14.3). The organization capability basically refers to the knowledge, attitudes, skills, and resources that are mobilized to carry out important tasks in achieving the desired goals (Neo & Chen, 2007). Systematic capabilities are embedded in people and processes so that good ideas can be translated into realistic policies, plans, and programs. Capabilities consist of three elements, namely: the ability to think ahead, the ability to think again, and the ability to think across. Organizational culture refers to the beliefs and values of a particular group that are shared as an accumulation of shared learning processes and histories (Neo & Chen, 2007). Culture consists of elements: values, beliefs, and behavior adopted in an organization (Nurmantu, 2007). Dynamic governance shows the ability of an organization to develop adaptive policies in order to maintain sustainable development in the midst of rapid and uncertain changes.

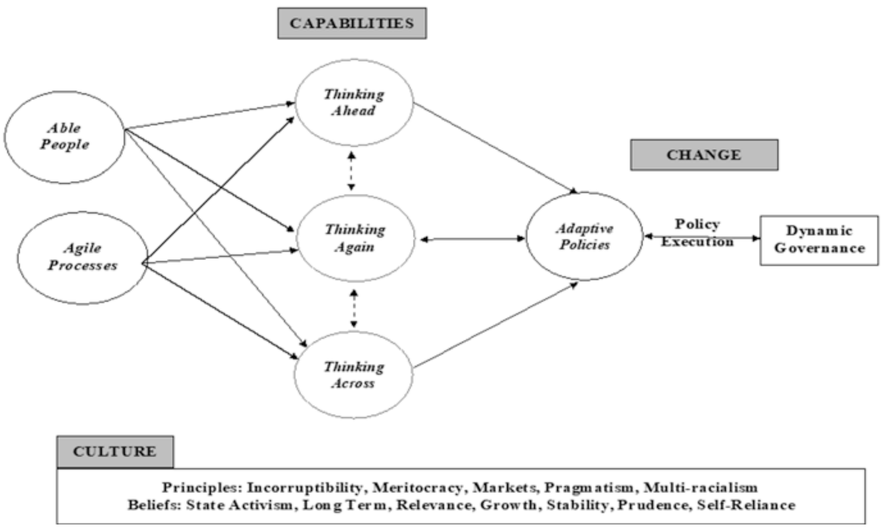


Fig. 14.3 The framework of dynamic governance. (Source: Neo & Chen, 2007)

14.3.3 Policy Hierarchical Process

Public policy is a system built from its constituent elements, namely: public policy, policy actors, and policy environment (Dunn, 1999). Public policy is seen based on the substance of the legislation in all sectors related to urban water management. Public policy actors influence policy, both government actors and non-government actors (Anderson, 2011). Actors can be individuals or groups that actively participate in the public policy process.

The policy process as a hierarchy is divided into three levels, namely: policy, organizational, and operational (Bromley, 2009). This concept put public policy as an institutional transaction that connects individual interests and collective decisions for resource allocation. The policy level is the formulation of public policies in the form of legislation and strategic policies at national and regional levels formulated by the legislative and judicative. The organizational level is the implementation of public policies in the form of institutional arrangements and technical regulations to implement public policies in the form of operational regulations and policies. The operational level is the implementation of policies carried out by central government, local governments, private sector, and community.

The pattern of interaction among actors at the operational level is seen based on perceptions, assumptions, and policies to be implemented. Perceptions, assumptions, and policies are influenced by the limited rationality and opportunistic nature of actors toward these policies. This pattern of interaction provides results that are accepted or rejected depending on the interests of each actor. If there is a difference of interest, the results tend to be rejected. On the other hand, if there are similarities in interests between actors, the result is a compromise. The results of the policy process are assessed based on externalities that occur and provide feedback to institutions at the policy and organizational levels (Fig. 14.4).

14.3.4 Theoretical Reflection

This research adopts the dynamic governance concept conducted in Singapore combined with the theory of the public policy hierarchy process. Theoretically, the dynamic governance model was developed in an interdisciplinary approach to environmental science, especially linking the concept of sustainable development with the concept of environmental governance and metropolitan urban areas. The concept of dynamic governance becomes an enabling environment for the achievement of sustainable urban water management objectives. This dynamic governance model was developed within the framework of a policy hierarchical policy starting at policy, organizational, and operational levels as a response to the complexity of environmental problems. A case study of metropolitan urban areas reflects the complexity of socio-ecological and multi-level governance issues.

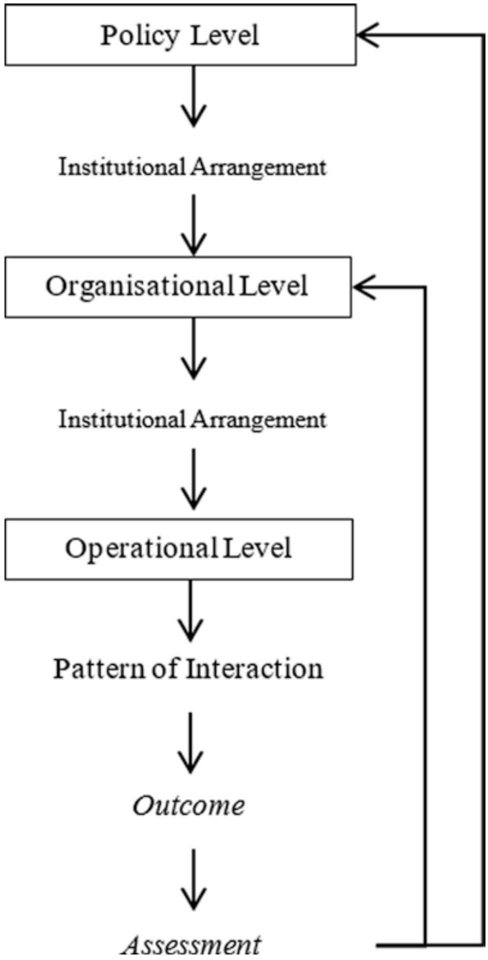


Fig. 14.4 Policy hierarchy process. (Source: Bromley, 1989)

Sustainable urban water management is closely related to targets and indicators of fulfilling state obligations on the right to water, which include: quantity, quality, continuity, and affordability. The water quantity refers to the amount of water that is sufficient and sustainable for minimal needs for daily living. The water quality refers to the quality of water that must meet the qualifications of healthy, safe, and proper. The continuity refers to water availability at any time. The affordability refers to physically accessible, economically affordable, and non-discriminatory. The fulfillment of targets and indicators is carried out comprehensively by taking into account aspects of environmental, social, and economic sustainability development. Governance is the main prerequisite to ensure the realization of targets and indicators for sustainable urban water management. The combination of the concept of dynamic governance and the theory of the policy hierarchy process is shown in Fig. 14.5.

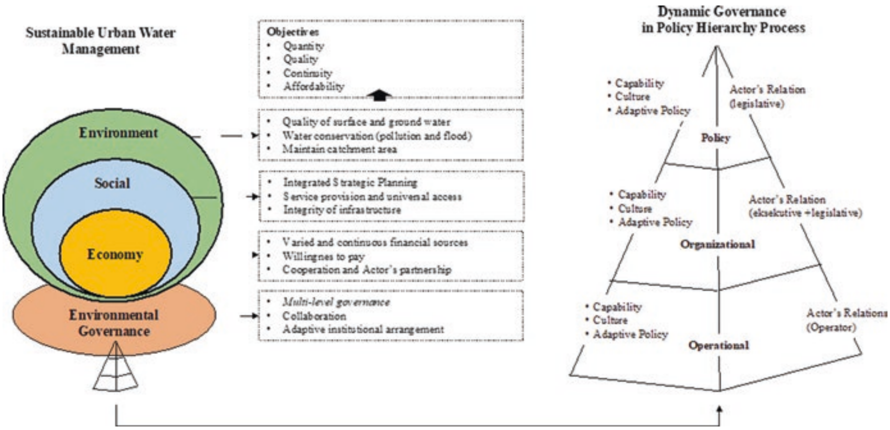


Fig. 14.5 Theoretical framework of the conceptual model of dynamic governance in sustainable urban water management. (Source: Author's own figure, 2018)

14.3.5 Bandung Metropolitan Area as a Case Study

The Bandung Metropolitan Area (BMA) is a national strategic area as stipulated in the National Spatial Plan. It comprises five administrative cities/districts namely: Bandung City, Cimahi City, Bandung District, West Bandung District, and Sumedang District. The total area of the BMA is approximately 348.261 ha. The total population of the BMA in 2018 was 8.7 million, which accounted for 2.9% of the Indonesian population.

The BMA has experienced rapid urban population growth in the core areas where land availability is very limited, and periurban areas, a place where the socioeconomic transformation process from rural to urban occurs. Similar to other developing countries, periurban areas dynamically grow and develop. Rapid population growth and increased economic activity led to land use changes, mostly the conversion of agricultural land into built-up areas. The expansion of built-up area led to changes in hydrological functions.

Uncontrolled land-use conversion in the catchment area of the BMA has resulted in declining water resources and scarcity of clean water in the dry season, low water quality, water pollution, and flood during the rainy season. Several water problems in the BMA include: pollution of water sources, deficit of raw water sources, exploitation of groundwater, and inadequate drinking water and wastewater infrastructure services. The current urban water management in the BMA is conducted separately by actors and institutions at the national, provincial, and city/district levels. This fragmented urban water management could negatively affect the future urban sustainability.

14.4 Construct a Conceptual Model of Dynamic Governance in Sustainable Urban Water Management

14.4.1 Description of the Problem Situation

There are three analyses carried out to describe the problem situation, namely: first analysis (intervention), second analysis (social), and third analysis (political) on the perceptions of the actors in order to obtain a rich picture of the problem.

First Analysis The first analysis is a step to determine the three parties who play an important role related to the problem situation, namely: (a) Clients. The clients in this research are the Central Government in this case the Ministries/Institutions, the Provincial Government, and the District/City Governments, (b) Practitioners in this research are researchers, (c) The Owner of the issues is actors related to urban water management in Bandung Metropolitan Area which are categorized into.

Second Analysis The second analysis (social system) includes three important social elements, namely: roles, norms, and values. ***Roles***, Indonesia's water management involves various actors and institutions at different levels of government starting from national to local. Actors are people and/or institutions at different levels of government whose tasks and responsibilities are relevant to, and directly involved in, the urban water sector. With its nature of multi-actors and multi-sectors, the coordination among actors and institutions becomes key requirement in order to improve the efficacy and efficiency of urban water governance. Types of actors in urban water governance can be categorized into three different groups namely: Nonexecutive Government Actors, Executive Government Actors, and Nongovernment Actors. Table 14.2 shows the types of actors in urban water governance.

Norms Regulatory framework is a critical element in shaping urban water governance. Indonesia's water regulatory framework is continuously evolving. Water law refers to all law related to water including water resources, ground water, public regulation of waters (environmental, public health, pollution, etc.), and other related water issues. Since its independence, Indonesia has stipulated three water laws namely Law No. 11/1974 on irrigation and Law No. 7/2004 on water resources. However, Law No. 7/2004 was annulled by the Constitutional Court in 2015 and has been revised by Law No 17/2019 on Water Resources. This law attempts to strike a balance between public and private interest by giving the public the first priority in access to water sources. Private sector engaged in drinking water supply must also enter into a contract with the regional government-owned enterprise in charge of the drinking water supply in the area. However, Law No. 11/2020 on Job Creation (Omnibus Law) has amended several provisions on water resources law such as the deleting of seven articles with regard to the division of authorities on water resource among government levels and the changes of some articles. Water is a highly com-

Table 14.2 Types of actors in urban water governance

Type of actor	National	Province	District/City
Non-executive government actor	House of representative (DPR). State audit Agency (BPK).	Provincial house of representative (DPRD)	District/City house of representative (DPRD)
Executive government actor	Coordinating Ministry of Economic Affairs. Ministry of Public Works and Housing. Ministry of Environment and forestry. Ministry of Energy and Mineral Resources. Ministry of Health. Ministry of Home Affairs. National Development Planning Agency/ Bappenas. National Water Resources Council (DSDAN).	Water resources agency. PSDA unit for Citarum River. Energy and mineral resources agency. Environmental agency. Housing and settlement agency. Health agency. Development planning agency. Water resource management Coordination team (TKPSDA) Citarum.	Development planning agency. Environmental agency. Health agency. Housing, settlement and land agency. Health agency.
Nongovernment actor	Nongovernment organization, practitioner, professional association, water operator (institutional and/or companies-based).	Nongovernment organization, practitioner, professional association, water operator (institutional and/or companies-based).	Nongovernment organization, practitioner, professional association, water operator (institutional and/or companies-based).

Source: Analysis (2018)

plex problem with many different functions. Water issues are discussed in many sectoral laws such as forestry, environmental, energy, health, and local governance. There is also strong linkage between water and land use and spatial plan as regulated in Law No. 26/2007 on spatial planning. Table 14.3 presents the laws and their relevance to urban water management.

Values Values are standards or criteria that are considered appropriate to the role of each actor. In urban water management, the roles of actors at different levels of government do not yet represent the values that are considered important as the basis for action in the policy hierarchy process from policy, organizational and operational levels. The values that need to be developed at all these levels are leadership, cooperation, and collaboration as well as mutual awareness. In order to mobilize resources efficiently and effectively, the important values to be developed are related to cooperation and collaboration between actors at different levels of government.

Table 14.3 Laws and their relevance to urban water management

Law	Content
Law no. 11/2020 on job creation (omnibus law)	(a) Amends references to the licenses under the water Law to business license (*Perizinan Berusaha*) or approval (*persetujuan*); (b) does not remove local governments'authorities (such as issuing a license) under the water law; however, the authorities will now be subject to the norms, standards, procedures, and criteria determined by the central government
Law no. 17/2019 on water resources	(a) Provide protection and guarantee the fulfillment right to water; (b) guarantee the sustainability and the availability of water resources in order to provide fair benefits to the community; (c) guarantee the preservation of water resources functions to support the sustainability of development; (d) guarantee the creation of legal infrastructures for the implementation of community participation in the supervision of the water resources use from planning, implementation, and evaluation of utilization; (e) guarantee the protection and empowerment of the community, including indigenous peoples in the conservation of water resources; and (f) control the overall damage to water sector which includes prevention, mitigation and recovery efforts.
Law no. 32/2009 on environmental management and protection	(a) Water quality standards, (b) wastewater quality standards), (c) water quality, (d) control of water pollution, d) underground water collection tax, (e) conservation of water resources, (f) permit for wastewater disposal
Law no. 41/1999 on forestry	(a) the carrying capacity of the watershed, (b) determination of forest area for microclimate, aesthetic, and water catchment arrangements
Law no. 36/2009 on health	(a) Environmental health, (b) drinking water quality standards, (c) drinking water health requirements, (d) liquid waste, (e) polluted water
Law no. 23/2014 on local government	(a) Distribution of government affairs of water resources, (b) distribution of government affairs of drinking water, (c) distribution of government affairs of wastewater, (d) distribution of government affairs of groundwater

Source: Collected from various sources (2020)

Urban water management involves multiple sectors and multiple actors at different levels of government. Cooperation and collaboration are absolute prerequisites for the successful implementation of urban water management at all levels. Urban water management requires the awareness of all actors to be directly involved and contribute significantly in all activities. This awareness is built on knowledge and understanding of the importance of urban water management. Actors who have high awareness will seek and get incentives to carry out actions according to their respective duties and authorities.

Third Analysis The third analysis (political analysis) is conducted to answer how the power structure is expressed in a situation. The depiction of the power structure is carried out by explaining the political dynamics that influence each other at all levels, starting from policy, organizational, and operational. Political dynamics at the central level legislative (DPR) are shown by differences and conflicts of party political interests and the interests of electoral districts. Differences in interests affect the formulation of policies, budget allocations, and supervision of the implementation of policies and programs.

In the provision of drinking water, the legislative interest is more in the budgeting process to reflect the interests of the electoral district. The provision of drinking water is needed but is not necessarily a priority if there is no directive policy. Likewise, political dynamics at the regional level are highly dependent on the interests of the legislative. Political dynamics between executive government actors at the central Ministry/Agency level with provincial and district/city governments often occur in cross-regional water resource management and regional drinking water management. The allocation of raw water sources is usually an issue that creates a conflict of authority between the relevant actors. The head of district who have raw water sources feel that they have the authority to regulate their use, even though according to laws and regulations it is the authority of the central government.

14.4.2 Problems Expression Through Rich Picture

Based on the results of the description of the unstructured problem situation, the three-level analysis helps researchers get a rich picture of urban water management problems at the policy, organizational, and operational levels as shown in Fig. 14.6.

The problem of urban water management at the policy level is related to the overlapping of regulations and policies among sectors and the ineffective implementation of strategic policies. The overlapping of regulations and policies causes ineffective implementation of strategic policies at all levels of government. Synchronization and harmonization of central and regional policies in the drinking water management system (SPAM) in the era of regional autonomy has not gone well. The government formulates SPAM policies following the administrative boundaries of districts/cities, even though the condition of water resources follows geohydrological conditions that do not follow administrative boundaries.

The policy is generally applicable to all regions, whether they have or do not have water resources. This condition makes it difficult for water management models, especially for areas that do not have sufficient water sources. The target of achieving universal or 100% access to drinking water still faces many obstacles in its implementation (Interview with Directorate of SPAM, MOPW, 2017).

The problem of urban water management at the organizational level is related to the management of the urban water cycle which still separately involves many institutions/agencies at different levels of government according to their respective duties and authorities. The urban water cycle from raw water to distribution involves many institutions/agencies with duties and authorities in each of their respective sub-sectors (Interview with Directorate of SPAM, MOPW and Provincial Energy and Mineral Agency, 2017).

However, there is no single institution/agency that has the authority to secure everything from raw water to installation. The National Water Resources Council and the Water Resources Management Coordination Team are actually directed to be the institutions that coordinate all water-related stakeholders. The activities of

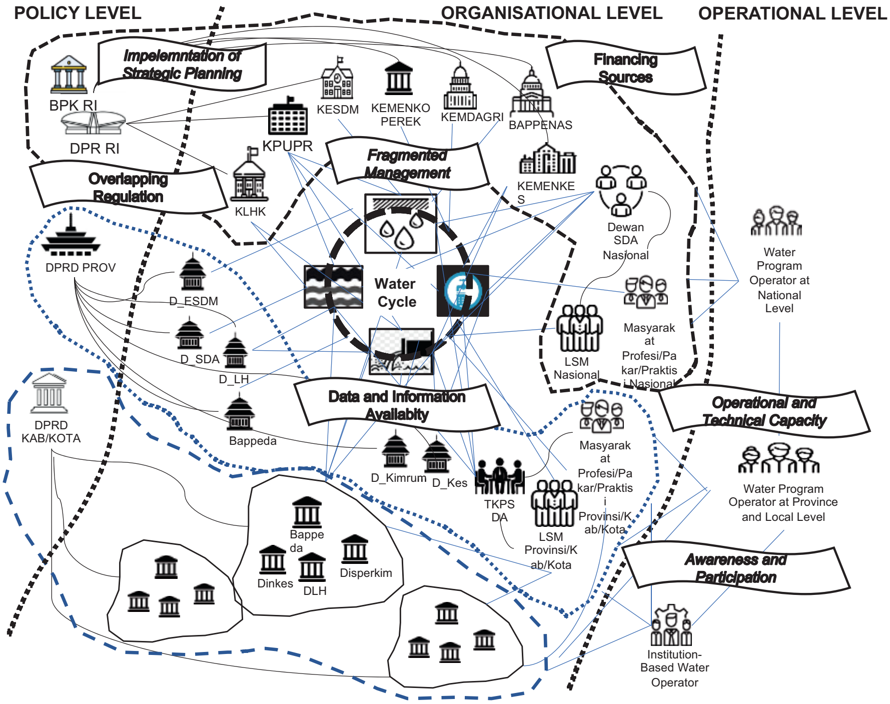


Fig. 14.6 Rich picture of urban water management problem. (Source: Analysis, 2018)

the coordinating teams at the central and local levels are highly dependent on the leadership and support of the secretariat (Interview with Indonesian Water Partnership and West Bandung District Government/DPKPP, 2017).

The condition of urban water management is exacerbated by the limited availability of information that hinders the effective implementation of programs and activities. Availability of information is also a factor that determines the success of policy formulation and development of strategic plans for sustainable water management. Inadequate information becomes an obstacle in establishing coordination and cooperation (Interview with Provincial Housing and Settlement Agency and Ministry of Health Official, 2017).

Fundamental changes related to data and information need to be made considering that until now official data on the water balance have not been agreed even though many scientific studies have been carried out, increasing uncertainty for actors in urban water management (Interview with KRUHA representative, 2017). The problem of urban water management is also constrained by limited access to finance and the ability to reach the community. The capacity of the government and local governments in financing is very limited compared to the amount required (Interview with West Bandung District Government/DPKPP, 2017).

The problems of urban water management at the operational level are limited technical and managerial capabilities, low public awareness, and participation in the

decision-making process. Technical operational and managerial skills are needed to promote better urban water management (Interview with Ministry of Health Official, 2017). Problems related to water are not limited to physical and technological aspects but involve social, economic, and institutional aspects that require good managerial skills. The low level of public awareness is often caused by a growing perception that the availability of water is very abundant and unlimited. The impacts of climate change on water resources will be significant in the future. Perceptions and understanding of the risks that threaten water availability in the future need to be continuously encouraged so that awareness arises to change and take action. Public awareness is shown by the low level of public awareness in using water efficiently (demand management). Stakeholder involvement in the decision-making process is a key prerequisite for successful urban water management. Operational policies are able to meet the needs and aspirations of the community as beneficiaries.

14.4.3 Conceptual Model of Dynamic Governance in Urban Water

The conceptual model of dynamic governance at the policy level (Subsystem 1) is intended to construct the dynamic governance approach in urban water management at the policy level at the central and metropolitan urban areas. The main focus is to describe future conditions and laws and regulations as well as strategic policies and to describe elements of dynamic governance by involving actors at the policy level, consisting of: (a) Actors at the Central level: DPR, BPK and related Ministries/Institutions, (b) Actors at the Metropolitan level: Provincial DPRD, District/City DPRD, Provincial Agencies, District/City Regional Agencies.

Dynamic governance can increase the effectiveness of policy development at the policy level in urban water management through strengthening the capabilities of people and processes to think ahead, think across, and think again and institutional culture. The construct of the dynamic governance conceptual model at the policy level is shown in Fig. 14.7.

At the policy level, activities to enhance people and process capabilities in: (1) Thinking ahead through drafting long-term strategic policy concepts; (2) Thinking across through synchronization and harmonization of laws and regulations; and (3) Thinking again through a continuous system of policy monitoring and evaluation.

Activities to improve organizational culture are carried out through the preparation of engagement platforms and collaboration between actors. Testing real-world conditions is done by comparing the activities in the conceptual model of dynamic governance at the policy level with how these activities are carried out in practice. Based on this comparison, further recommendations are made for the necessary changes (see Table 14.4).

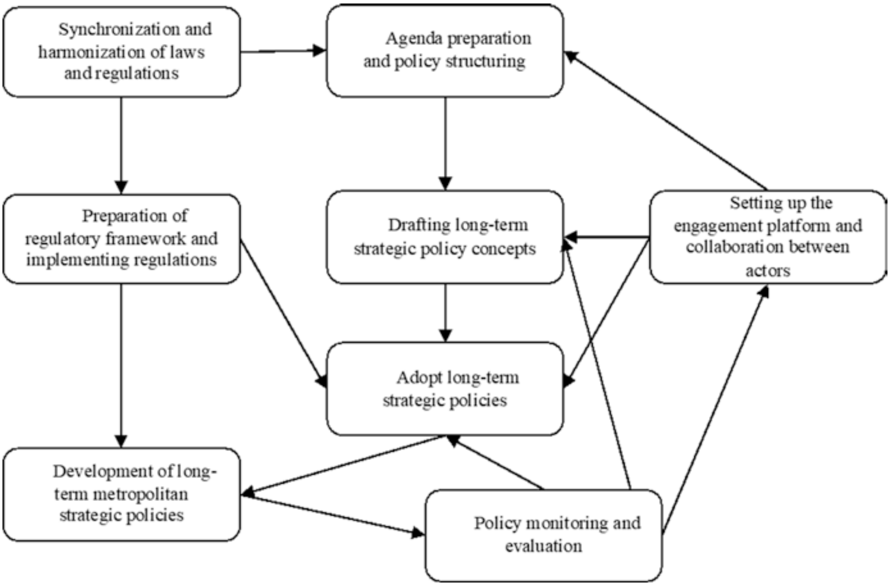


Fig. 14.7 Conceptual model of dynamic governance in urban water management at the policy level. (Source: Analysis result, 2018)

14.4.4 Conceptual Model of Dynamic Governance in Urban Water Management at the Organizational Level

The conceptual model of dynamic governance at the organizational level (Subsystem 2) is intended to construct a dynamic governance approach in the formulation of operational policies and institutional arrangements for urban water management at central government and metropolitan urban areas. Actors involved at the organizational level consisting of: (a) Actors at the Central level: Ministries/Institutions include: Ministry of Public Works and Housing, National Development Planning Agency/Bappenas, Ministry of Environment and Forestry, Ministry of Health, Ministry of Energy and Mineral Resources, Ministry of Home Affairs, NGOs at the central level, Professional Associations, Experts and Practitioners, Implementers of water-related programs at the central level; (b) Actors at the Metropolitan level: Provincial Agencies, District/City Agencies, Provincial/District/City level NGOs, Professional Associations, Experts and Practitioners, Implementers of Water-related Programs at the provincial/district/city level.

Dynamic governance can increase the effectiveness of developing operational policies and institutional arrangements for urban water management. The construct of the conceptual model of dynamic governance at the organizational level is shown in Fig. 14.8.

Table 14.4 Comparison between the conceptual model of dynamic governance and real-word situation at the policy level

Conceptual model activity	Y/N	How activities are carried out	Evaluation	Recommended change
Synchronization and harmonization of laws and regulations	Y	Implemented as part of the process of drafting laws and regulations	E	A mechanism for reviewing laws and regulations related to water is created in the context of a comprehensive regulatory arrangement
Preparation of regulatory framework and implementing regulations	Y	Discussions between the legislature and the government and stakeholders	P	Completion of government regulations on the water resources Law and follow-up to UUCK through a more transparent process and a roadmap for the preparation of operational regulations
Agenda preparation and policy structuring	N	As a study and initiative of each sector related to water	P	Built an integrated policy agenda related to water through policy advocacy that involves more stakeholders
Drafting long-term strategic policy concepts	Y	The legislature and the executive prepare in stages referring to the vision and direction of long-term national development policies	P	A better planning system is made so that a consistent and more realistic vision and goals can be formulated as well as long-term policy directions to be achieved
Adopt long-term strategic policies	Y	Legislative and executive build communication and mutual understanding in determining policy choices	E	Created a joint framework between K/L actors and DPR commissions in determining evidence-based policy choices
Setting up the engagement platform and collaboration between actors	N	Cooperation and coordination between actors based on the interests and concerns of each actor	P	Built an engagement and collaboration platform by utilizing containers and media
Development of long-term metropolitan strategic policies	Y	Ministries/Agencies and regional governments each prepare metropolitan strategic policies according to their duties and authorities	P	Create a better planning system involving multi-stakeholders so that an integrated, consistent, and implementable metropolitan strategic policy can be drawn up.
Policy monitoring and evaluation	N	The monitoring and evaluation process is carried out by institutions based on their respective interests	P	A more integrated monitoring and evaluation system is developed, useful in policy implementation and can encourage a better planning system

Source: Analysis results, 2018
Note: Y/N: the activity has been carried out (Y) and has not been implemented (N)
Assessment of activity: *G* Good, *E* Enough, *P* Poor

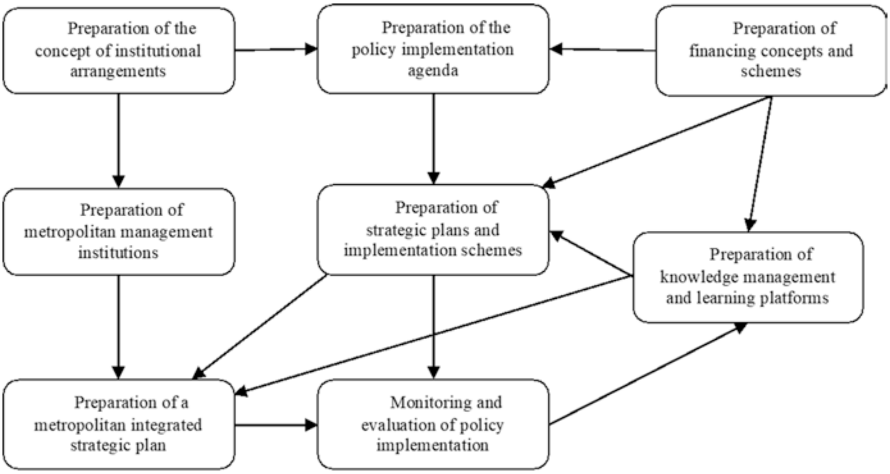


Fig. 14.8 Conceptual model of dynamic governance in urban water management at the organizational level. (Source: Analysis result, 2018)

At the organizational level, activities to improve people and process capabilities in: (1) Thinking ahead through the preparation of strategic plans and implementation schemes; (2) Thinking across through the preparation of the concept of institutional arrangements and continuous financing schemes; and (3) Thinking again through the monitoring and evaluation system of policy implementation.

Activities to improve organizational culture are carried out through the preparation of a knowledge and learning management platform. Real-world conditions are tested by comparing the activities in the conceptual model of dynamic governance at the organizational level with how these activities are carried out in practice. Based on this comparison, further recommendations are made for the necessary changes (see Table 14.5).

14.4.5 Conceptual Model of Dynamic Governance in Urban Water Management at the Operational Level

The conceptual model of dynamic governance at the operational level (Subsystem 3) is intended to construct the dynamic governance approach in the operationalization of urban water management policies at the central government and metropolitan urban areas to describe concrete actions by involving actors at the operational level consisting of: (a) Actors at Central level: Ministries/Institutions include: Ministry of Public Works and Housing, National Development Planning Agency/Bappenas, Ministry of Environment and Forestry, Ministry of Health, Ministry of Energy and Mineral Resources, Ministry of Home Affairs, NGOs at the central level, Professional

Table 14.5 Comparison between the conceptual model of dynamic governance and real-word situation at the organizational level

Conceptual model activity	Y/N	How activities are carried out	Evaluation	Recommended change
Preparation of the policy implementation agenda	N	It is carried out by each actor and their respective institutions/ institutions based on their respective issues and problems	P	An integrated policy implementation agenda related to water was built together with stakeholders as well as elaborated on the interests and concerns of each actor
Preparation of the concept of institutional arrangements	Y	The roles and responsibilities of each actor are carried out based on the duties and authorities stipulated in the laws and regulations	E	An institutional framework is made to regulate the roles and responsibilities of actors and leading actors that are mutually agreed upon
Preparation of financing concepts and schemes	Y	The financing scheme still relies on conventional financing sources	P	Non-conventional financing schemes are built that are easily accessible and available continuously
Preparation of knowledge management and learning platforms	N	Implemented by each institution based on the interests and concerns of each actor	P	Built an inclusive learning and knowledge management platform by utilizing access to information and the use of technology
Preparation of strategic plans and implementation schemes	Y	Ministries/Agencies prepare strategic plans and other sectoral plans to serve as directions for the implementation of strategic policies	P	A strategic plan implementation scheme is made with accurate information supported by institutional arrangements, financing support, and monitoring and evaluation systems
Preparation of metropolitan management institutions	N	Implemented in accordance with the roles and responsibilities of actors regulated in laws and regulations	P	An inclusive metropolitan management institutional model is built, represents the interests of all actors and allows a learning process and is adaptive to changes that occur
Preparation of a metropolitan integrated strategic plan	Y	Ministries/institutions and local Governments each prepare metropolitan strategic plans according to their duties and authorities	P	Created a medium-term planning system that better involves stakeholders and utilizes databases and access to information that is integrated, consistent, and can be implemented
Monitoring and evaluation of policy implementation	N	The monitoring and evaluation process is carried out with limited data and information availability	P	Developed a more integrated monitoring and evaluation system supported by a credible database and the use of information technology

Source: Analysis results, 2018
Note: Y/N: the activity has been carried out (Y) and has not been implemented (N)
Assessment of activity: *G* Good, *E* Enough, *P* Poor

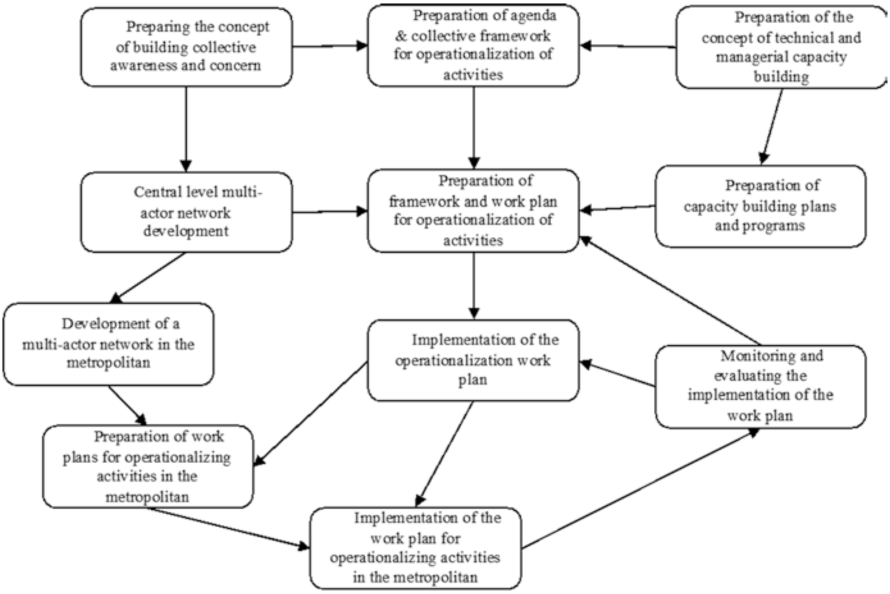


Fig. 14.9 Conceptual model of dynamic governance in urban water management at the organizational level (Source: Analysis result, 2018)

Associations, Experts and Practitioners, Implementers of water-related programs at the central level, Institutional-Based Operators; (b) Actors at the Metropolitan level: Provincial Agencies, District/City Agencies, Provincial/District/City level NGOs, Professional Associations, Experts and Practitioners, Implementers of Water-related Programs at the Provincial/District/City level, Institutional-Based Operator.

Dynamic governance can increase the effectiveness of the operationalization of urban water management policies in an integrated manner. The construct of the dynamic governance conceptual model at the operational level is shown in Fig. 14.9.

At the operational level, activities to improve people and process capabilities in: (1) Thinking ahead through the preparation of a collective agenda and framework as well as a work plan for operationalizing activities; (2) Thinking across through the preparation of technical and managerial capacity building concepts; (3) Thinking again through the monitoring and evaluation system of the implementation of the work plan.

The improvement of organizational culture is carried out through the preparation of concepts to build awareness and capacity as well as the development of multi-actor and multi-sectoral networks.

Testing real-world conditions is done by comparing the activities in the conceptual model of dynamic governance at the operational level with how these activities are carried out in practice. Based on this comparison, further recommendations are made for the necessary changes (see Table 14.6).

Table 14.6 Comparison between the conceptual model of dynamic governance and real-word situation at the operational level

Conceptual model activity	Y/N	How activities are carried out	Evaluation	Recommended change
Preparation of agenda & collective framework for operationalization of activities	N	It is carried out by each actor and their respective institutions/institutions based on their targets, priorities, and capacity of existing resources	P	Develop a collective agenda and framework with clear targets and locus, as well as elaborating on the interests and concerns of each actor
Preparation of framework and work plan for operationalization of activities	Y	Ministries/Agencies prepare sectoral work plans and plans that become a reference for implementation in the field	P	A work plan for operationalization of activities is made with a clear location and target as well as resource support
Preparation of concepts and platforms to build collective awareness and concern	N	Performed by each actor based on their own understanding and awareness	P	An incentive system is built for the community to be able to increase understanding and awareness
Development of multi-actor and multi-sector network	N	Performed by each actor based on their own interests and needs	P	A multi-actor and multi-sector network system is built in stages at all different levels of government
Implementation of the work plan for operationalizing activities in the metropolitan	Y	Ministries/Agencies and regional governments each prepare a metropolitan operational work plan according to their duties and authorities	P	An integrated, measurable, and implementable annual planning and budgeting system is created
Monitoring and evaluating the implementation of the work plan	Y	The monitoring and evaluation process is carried out by K/L and other actors as a reporting procedure	P	Developed a more integrated monitoring and evaluation system supported by a credible database and the use of information technology

Source: Analysis results, 2018
Note: Y/N: the activity has been carried out (Y) and has not been implemented (N)
Assessment of activity: *G* Good, *E* Enough, *P* Poor

14.4.6 Activities to Reconstruct Dynamic Governance Models in Urban Water Governance at All Levels

Based on the understanding and analysis of the conceptual model in subsystem 1, subsystem 2, and subsystem 3, the activities to reconstruct the dynamic governance concept in urban water management are described as follows (Table 14.7):

Table 14.7 Activities at each level related to the dynamic governance

Activity at each level	Dynamic capabilities of people and process			Organization culture
	Thinking ahead	Thinking across	Thinking again	
Policy	Agenda preparation and policy structuring	Synchronization and harmonization of laws and regulations	Policy monitoring and evaluation	Setting up an engagement platform and collaboration between actors
	Drafting long-term strategic policy concepts	Preparation of regulatory framework and implementing regulations	Metropolitan strategic policy formulation	
	Adopt long-term strategic policies			
Organizational	Preparation of the policy implementation agenda	Preparation of the concept of institutional arrangements	Monitoring and evaluation of policy implementation	Knowledge management and learning platform setup
	Preparation of strategic plans and implementation schemes	Preparation of metropolitan management institutions	Preparation of financing schemes and mechanisms	
	Preparation of metropolitan strategic plans	Preparation of continuous financing concepts and schemes		
Operational	Preparation of a collective agenda and framework for operationalization of activities	Monitoring and evaluating the implementation of the work plan	Preparation of the concept of technical and managerial capacity building	Concept preparation builds awareness and capacity Development of multi-actor and multi-sector network
	Preparation of framework and work plan for operationalization of activities		Preparation of capacity-building plans and programs	
	Preparation of operationalization work plan Activities in the metropolis			

Source: Analysis results, 2018

14.5 Adaptation of Dynamic Governance Model in Sustainable Urban Water Management in Bandung Metropolitan Area

Adaptation is intended to describe the activities developed in the dynamic governance model into an implementation strategy that contains the stages and priorities of the activities to be implemented. The outputs resulting from this adaptation process are systematic steps at each stage to implement dynamic governance activities in sustainable urban water management in the Bandung Basin Urban Area.

Table 14.8 Implementation strategy for dynamic governance in sustainable urban water management in Bandung Metropolitan Area

No	Stage and activities	T1	T2	T3	T4	T5	Locus
A	**Regulation and policy**						
1	Completion of government regulations as derivatives of the water resources Law and UUCK/job creation law	X					CG
2	Sustainable urban water management policy working paper	X					CG, PG
3	Policy advocacy for sustainable urban water management		X				CG, PG, LG
4	Integration into planning and budgeting at the central level		X				CG
5	Integration into planning and budgeting policies at the local level		X				PG, LG
B	**Implementation scheme**						
1	Agenda for implementing sustainable urban water management policies	X	X				CG
2	Joint framework between ministries/agencies, DPR, and BPK		X				CG
3	Institutional framework at the central and local levels		X	X			CG, PG, LG
4	Conventional and non-conventional financing schemes		X	X			CG, PG, LG
5	Stakeholder engagement and collaboration platform			X			CG, PG, LG
6	Knowledge management and learning platform		X	X	X		CG, PG, LG
7	Baseline data and information	X	X				CG, PG, LG
8	Medium-term strategic plan for sustainable water management		X	X			PG, LG
C	**Implementation**						
1	Implementation agenda and framework	X	X				CG, PG, LG
2	The annual work plan		X				CG, PG, LG
3	Incentive and disincentive mechanisms for stakeholders			X	X	X	PG, LG
4	Integrated monitoring and evaluation system	X	X	X	X	X	CG, PG, LG

Source: Analysis result, 2018

Note: *CG* Central Government, *PG* Provincial Government, *LG* District/City Government

The strategy for implementing the dynamic governance model in sustainable urban water management in the Bandung Metropolitan Area is drawn up within a period of 5 (five) years. The stages are as follows:

14.5.1 Preparation of Regulation and Policy

This stage is the first stage carried out in the first 2 (two) years to prepare the basis for legislation and strategic policies for urban water management both at the central and regional levels. The expected results at this stage are the establishment of a synchronization mechanism and harmonization of laws and regulations related to water at the central level, the completion of government regulations as derivatives of the Water Resources Law and UUCK (Job Creation), the establishment of systems and mechanisms for strategic planning of urban water management policies at the central and local levels. at the metropolitan level and the establishment of an advocacy agenda for strategic urban water management policies.

14.5.2 Implementation Scheme

This stage is the second stage carried out in the second and third years to prepare institutional support for implementing strategic urban water management policies. The main focus is to prepare institutional support, financing schemes, knowledge and learning management as well as operational policy systems and mechanisms. The expected results at this stage are the formulation of a policy implementation agenda that is agreed upon by all actors at the central and regional levels, the establishment of an institutional framework for urban water management at the central and regional levels, the development of financing schemes and the establishment of an institutional form of metropolitan management as well as a strategic policy implementation scheme in the medium term.

14.5.3 Implementation

This stage is the third stage which begins in the second year onwards to support the implementation of strategic policies that have been formulated in the first stage and institutional support is prepared in the second stage. The expected results at this stage are the formulation of an agenda and framework as well as operationalization work plans at the central and metropolitan levels, the establishment of annual planning and budgeting systems, the establishment of incentive mechanisms and multi-actor and multi-sector network systems at the center and regions as well as the establishment of a monitoring and evaluation system supported by a database (Table 14.8).

14.6 Conclusion

This research resulted in a conceptual model of dynamic governance in sustainable urban water management which was developed based on a hierarchical policy process starting from the policy, organizational, and operational levels involving multi-actor and multi-sector at different levels of government. Dynamic governance is demonstrated through a series of activities resulting from the interaction of elements of dynamic capabilities of people and processes and organizational culture at every level to realize the achievement of sustainable urban water management goals.

Series of activities were developed to respond to the problem situation of urban water management at the central government level and metropolitan urban areas. Adaptation of the dynamic governance model is applied to the case of water management in the Bandung Metropolitan Area as an implementation strategy in urban areas that are fast growing and have complex socio-ecological problems related to water management.

Some suggestions based on the results of this research, especially for academics in the field of environmental science and public policy, are to conduct further research to (a) test dynamic governance models in other environmental issues, (b) adapt dynamic governance models in other metropolitan urban areas, and (c) applying the conceptual model of dynamic governance to public policy advocacy in Indonesia. Some suggestions for the government, regional government, and legislative members at the national and local level, are to: (a) adopt key steps developed in the dynamic governance model in urban water management to synchronize and harmonize laws and regulations related to water resources and its operational regulations, (b) develop platforms for collaboration, knowledge management and learning in the dynamic governance model as a vehicle to improve dynamic capabilities and organizational culture within the Government and Regional Government and legislative members, (c) improve public policy process at national, provincial and district/city levels by adopting key steps that can be developed in the formulation of water management policies involving actors and stakeholders at different levels of government.

References

Alegre, H., Almeida, M. C., Covas, D., Cardoso, M. A., & Coelho, S. T. (2012). An integrated approach for infrastructure asset management of urban water systems. *Water Asset Management International, 8*(2), 10–14.

Bahri, A. (2012). Integrated urban water management. *TEC Background Paper, 16*.

Biswas, A. K. (2004). Integrated water resources management: A reassessment. *Water International, 29*(2), 248–256.

Briony, C., Ferguson, B. C., Brown, R. R., & Deletic, A. (2013). Diagnosing transformative change in urban water systems: Theories and frameworks. *Global Environmental Change, 23*(1), 264–280.

Bromley, D. W. (1989). *Economic interest and institutions: The conceptual foundations of public policy*. Basil Blackwell.
Brown, R. R., Keath, N., & Wong, T. H. F. (2009). Urban water Management in cities: Historical, current and future regimes. *Water Science and Technology, 59*, 847–855.
Burn, S., Maheepala, S., & Sharma, A., (2012). Utilising integrated urban water management to assess the viability of decentralised water solutions. *Water Science & Technology.* In Press.
Chanan, A., & Woods, P. (2006). Introducing total water cycle management in Sydney: A Kogarah Council initiative. *Desalination, 187*(1–3), 11–16.
Checkland, P., & Scholes, J. (1990). *Soft systems methodology in action*. West Sussex.
Clar, M. L., Coffman, L. S., Cheng, M. S., & Weinstein, N. (1998, June 9–12). *Low-impact development (LID) hydrologic analysis and design*. Paper presented at the 25th annual meeting of the water resources planning and management division, American Society of Civil Engineers,
de Oliveira, R. P., Matos, J. S., & Monteiro, A. J. (2015). Managing the urban water cycle in changing environment. *Water Utility Journal, 9*, 3–12.
Dijk, M. P. (2012). Introduction. *International Journal of Water, 6*(3/4), 137–154.
Ding, G. K. C., & Gosh, S. (2017). Sustainable water management – A strategy for maintaining future water resources. *Encyclopedia of Sustainable Technologies*, 91–103.
Dunn, W. N. (1999). *Analisis Kebijakan Publik*. Gadjah Mada University Press.
Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources, 30*, 8.1–8.33.
Furlong, C., De Silva, S., Guthrie, L., & Considine, R. (2016). Developing a water infrastructure planning framework for the complex modern planning environment. *Utilities Policy, 38*, 1–10. https://doi.org/10.1016/j.jup.2015.11.002
Gupta, J., Pahl-Wostl, C., & Zondervan, R. (2013). 'Glocal' water governance: A multi-level challenge in the anthropocene. *Current Opinion in Environmental Sustainability, 5*, 573–580.
Hatmoko, W., Radhika, & Amirwandi. (2013). *Krisis Air dan Kelangkaan Air Pada Wilayah Sungai di Indonesia*. Puslitbang Sumber Daya Air, Badan Litbang Pekerjaan Umum.
Ichimura, M. (2003). Urbanization, urban environment and land use: Challenges and opportunities. An Issue Paper*: APFED Expert Meeting*. China.
Kasim, A. (2015). Reformasi Sempurna Melalui Dynamic Governance. In A. Kasim (Ed.), *Merekonstruksi Indonesia: Sebuah Perjalanan Menuju Dynamic Governance*. Yayasan Indonesia Lebih Baik.
Maheepala, S., Blackmore, J., Diaper, C., Moglia, M., Sharma, A., & Kenway, S. (2010). *Integrated urban water management planning manual*. Water Research Foundation, Denver, CO.
Marcotullio, P. J., & Solecki, W. (2010). *What is a City? Old Debate, New Implications*. UGEC Viewpoints. Arizona State University.
Marlow, D. R., Moglia, M., Cook, S., & Beale, D. J. (2013). Towards sustainable urban water management: A critical reassessment. *Water Research, 47*(20), 7150–7161.
McGrane, S. J. (2016). Impacts of urbanization on hydrological and water quality dynamics, and urban water management: A review. *Hydrological Science Journal, 61*(13), 2295–2311.
Mitchell, V. G. (2006). Applying integrated urban water management concepts: A review of Australian experience. *Environmental Management, 37*(5), 589–605.
Molinos-Senante, M., & Sala-Garrido, R. (2016). Performance of fully private and concessionary water and sewerage companies: A metafrontier approach. *Environ Sci Pollut Rest Int, 23*(12), 11620–11629.
Monfort, C., Michels, A., Frankowski, & Andrea. (2014). *Governance models and partnerships in the urban water sector a framework for analysis and evaluation*. The Hague, Utrecht & Tilburg.
Nababan, M. L. (2012). *Governance of inter-local government for water supply system in Indonesia.* Dissertation. Graduate School of Engineering Department of Urban Management Kyoto University.
Neo, B. S., & Chen, G. (2007). *Dynamic governance: Embedding culture, capabilities and change in Singapore*. World Scientific Publishing. Co. Pte. Ltd.

Nurmantu, S. (2007). *Budaya Organisasi, Dari Chester I.* Midada Rahma Press.
Pahl-Wostl, C. (2007). Transition towards adaptive management of water facing climate and global change. *Water Resources Management, 21*(1), 49–62.
Pahl-Wostl, C., Lebel, L., Knieper, C., & Nikitina, E. (2012). From applying panaceas to mastering complexity: Toward adaptive water governance in river basins. *Environmental Science & Policy, 23*, 24–34.
UNDP. (2006). *Human development report, beyond scarcity, power, poverty and the global water crisis*. UNDP.
Wang, Y., Sun, M., & Song, B. (2017). Public perceptions of and willingness to pay for Sponge City initiatives in China. *Resource, Conservation and Recycling, 122*, 11–20.
Water by Design. (2010). *Total water cycle management planning guideline for South East Queensland (draft, September 2010)*. In Department of Environment and Natural Resource Management (Ed.). Brisbane.
WHO. (2012). *UN-water global annual assessment of sanitation and drinking-water (GlAAS) 2012 report: The challenge of extending and sustaining services*. WHO.
Wong, T. H. F., & Brown, R. R. (2009). The water sensitive city: Principles for practice. *Water Science and Technology, 60*(3), 673–682.
Zhao, S. Q., Da, L. J., Tang, Z. Y., Fang, H. J., Song, K., & Fang, J. Y. (2006). Ecological consequences of rapid urban expansion: Shanghai, China. *Frontier in Ecology and Environment, 4*(7), 341–346.

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Chapter 15
Governance by Accident: The Role of Civil Society in Shaping Urban Environmental Governance

Benny D. Setianto and Budi Widianarko

Abstract The revival of the civil society movement was triggered by the fall of communism in the east-bloc countries and the so-called third-wave democracy in many developing countries, and the notion of reinventing the government's role in the west. Inspired by these phenomena, this written literature research examined the impact of these transitions occurring in the late nineties on environmental governance, especially regarding the role of civil society. The research focused on the role of civil society to provide a theoretical framework for the dynamic adaptations occurring in the Indonesian government in relation to the emerging civil society movements and the political turmoil (from authoritarian to more democratic governance) associated with them. This was done by emphasizing, first, the changing of acts regulating decentralization throughout the three-layered governmental structure. Secondly, I examined how governmental institutions dealt with environmental protection and how the civil society movements worked. This study demonstrated that civil society movements are not a single homogenous entity. Secondly, dissemination of power among governmental structures was not merely a technical matter aiming to provide a better service but also a notion of political power contestation. Thirdly, the dynamic relationships within civil society organizations, the multi-level governmental institutions, and the various stakeholders in the private sector have led to a mode of governance that cannot be designed to achieve a common goal. This formulated the main finding of my study, which proposes that "governance by accident" instead of "governance by designed" should be considered a new model of environmental governance.

Keywords Civil society · Governance · Environmental policy · Governmental structure · Indonesia

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15.1 Introduction

After the last authoritarian president of Indonesia, Mr. Soeharto resigned in 1998, Indonesia went through a very dynamic governance process. Firstly, in the struggle for power among political parties. Secondly, while these political changes mainly occurred at the national level, significant differences also appeared at the provincial and municipal levels of government. It became a subject of a political contest to which level of government, national, provincial, or municipal, more power should be allocated. As a result, the laws regulating the decentralization of power kept changing. The first law was issued right after the Reformasi, and it placed the most significant power in the hands of municipalities. The national government retained only five policy domains (Foreign Affairs, National Security, Judiciary System, Monetary and Fiscal Policy, and Religion) while most other domains were decentralized to the level of the Mayor (issues regarding the city) or the Regent (head of regency) (RoI, 1999, 22). The provincial government became an administrative power with a coordinating function among municipalities (RoI, 1999, 22 Art 9).

Booth, in a study of the Indonesian policy of poverty alleviation, argued that the new decentralization act was the first in the world that brought about the most decentralized governance system that had ever been effective (Booth, 2003, 181–202). Ostwald agreed with Booth's comment and denoted the decentralization movement in Indonesia as a "big bang" (Ostwald et al., 2016, 139–156). Nevertheless, the first decentralization law was merely effective for 5 years before another one replaced it (RoI, 2004, 32). This new law took some power away from the municipalities and gave it back to the provincial governments. In addition, under the new law, the head of the provincial and municipal governments was directly elected by the people. This allocated new power to the executive branch of local government. Before the *Reformasi,* the head of the local government was appointed by the local parliament, which made the head of the local government dependent upon the ruling party in the parliament (Widodo, 2003 179–193). In the new situation, as the head of the provincial government, the governor was no longer just the extended arm of the national government since the governor was elected directly by the people. This significantly strengthened the position of the provincial government *vis-à-vis* the municipal government, compared to the situation just after the *Reformasi*.

In addition to these governance re-arrangements between state, province, regency, and municipality, the dynamics of the citizen-state are also interesting to examine. In the early stage of the Reformasi, the door of democratization was wide open, especially in terms of freedom of expression through the mass media. Hundreds of new newspapers were published, and most of them freely discussed the Indonesian governmental changes. I note here that the emergence of a robust civil society following the collapse of an authoritarian regime is not a unique phenomenon. It also occurred in Eastern Europe (Raska, 2017, 109–110), in Latin America (O'Donnel, 2002, 6–12), and in some East Asian Countries (Gleason, 2003; Lim & Shui, 2003, 561–582; Han, 2014, 173–190).

Over time the number of printed mass media gradually decreased because people were no longer interested in reading stories on how the people toppled the government and how corrupt the previous government was. Even though the intensity with which people were involved in decision-making processes had increased, this did not correlate positively with a feeling of satisfaction on the side of the people.

From this short sketch of Indonesia's societal and political changes over the past 20 years, one may conclude that the rise of civil society as part of the democratization process was a significant factor. What is meant by "civil society"?

15.2 Civil Society: Constantly Changing?

Despite the frequent use of "civil society," the debate about the correct definition continues. In 1992 Cohen stated that "there is no sufficiently complex theory (on civil society author) that is available today" (Cohen & Arato, 1992). More recently, Rosenblum mentioned that not every society has the same understanding of civil society because it is historically bound (Rosenblum & Post, 2002). Rosenblum's book characterizes civil society primarily as a society that is based on the rule of law, which is in contrast to a society that is not based on the rule of law (the state of "nature") (O'Brien, 1999b). Secondly, Salamon and Anheier posited that civil society is located somewhere in between the state as a political society and the market as an economic society, while both sides influence and appropriate it (Salamon & Anheier, 1997). Thirdly, Warren proposed that civil society is characterized by being a social organization within which voluntary associative relations are dominant (Warren, 1999). In other words, considering those streams, civil society could be characterized as a society (1) based on the rule of law or civic virtue (Macedo, 2001), (2) located between the market and the state, and (3) one that is part of the domain of social organizations dominated by associative relations.

Yet, Bestor, for instance, believes that there are fundamental differences between civil society in the developed and the developing world (Bestor, 2004). And Rosenblum argues that not every society has the same concept in understanding civil society because it is historically bound (Rosenblum & Post, 2002; Hellyer, 2015, 131–150).

Scholars underscore the vagueness of the terminology and point out how widely diverging the connotations of the various thinkers are (Beem, 1996; Green, 1999, 2). The London School of Economics and Political Science has tried to capture the conceptual essence of civil society (LSE, 2001) and yet it remains a controversial definition (Anheier, 2014, 335–339). Arato concludes that civil society must be securely institutionalized before it can become a key terrain of participatory politics in the long term (Arato, 2000). Beem mentions that civil society has become "the new *cause celebre* in political thought" (Beem, 1996) since civil society is believed to be the new arena for (re)arranging society with or without government involvement.

Habib and Kotze warn that reducing civil society to an amorphous and homogenous entity, that is generally described as progressive and, to some extent, exclusively associated with NGOs and CBOs, will lead to a failure in understanding that other organizations can also be classified as civil society organizations (Habib & Kotze, 2002). Thus, Habib and Kotze note that it should be recognized that the conceptual heterogeneity of civil society is its most important characteristic.

Considering these notions, there are three prominent positions in describing and characterizing the relationships between civil society and the state. First, civil society is seen as a community that maintains a set of shared norms and lives under the rule of law. Some scholars identify civil society as a society that seeks civic virtue, a *societas civilis* in contrast to a barbaric society (O'Brien, 1999b). O′ Brien, in assessing the work of Thomas Hobbes and John Locke, puts them as two of the founders of political philosophy in the age of reasoning, the seventeenth century (O'Brien, 1999a). He asserts that Hobbes coined the notion that society is not a natural state but the result of a social contract. This is so, Hobbes argues because society and the state are both not natural; the natural state is one in which people follow their emotions rather than reason (Pietrzyk, 2001). The result of the natural state will be that people who follow their emotions and have equal freedom will fight with each other as "all against all."

Second, civil society is perceived as a non-governmental part of society, which differs from political society or the state. John Locke argued that political power should not be exercised by a single body. Instead, John Locke differentiates between government and society such that the power of the government does not threaten the rights of society (Pietrzyk, 2001): "Wherever, therefore, any number of men are so united into one Society, as to quit every one his Executive Powers of the Law of Nature, and resign it to the public, there and there only is he in a Political or Civil Society… And this puts men out of the State of Nature into that of a Commonwealth" (Colas, 2002). Scottish philosopher and historian Adam Ferguson believes that "society is the natural state of men" (Pietrzyk, 2001). For Ferguson, not all societies can be called civil, but only those societies in which individuals enjoy civil liberties protected by the government. Moreover, although he considers the commercial society (economic society) as the most advanced stage of social development, he does acknowledge the dialectic nature of virtue and corruption in such societies (Ferguson, 1809). Thus, civil society can decline if individuals lose the characteristics of a "political animal" (*zoön politikon*, a concept coined by Aristoteles).

Third, civil society is seen as a realm separate from the political society/state and economic society (market). Gramsci asserts that civil society should have an autonomous space in the system which "appears as the third term, due to its being identified, no longer with the state of nature, nor with an industrial society, nor generally with the pre-state society but with the factor of hegemony" (Schlesinger, 2010). Thus, according to Gramsci, civil society is not only placed *vis-à-vis* the state of nature but also *vis-à-vis* the state, the church, and economic society. Gramsci portrays civil society as the arena, separate from state and market, where ideological hegemony is contested. The workings of a civil society imply a broad spectrum of

social organizations as well as community organizations, both of which either challenge or sustain the existing order (Lewis, 2001).

Based on the preceding, it can be concluded that the term civil society, despite its frequent use in scientific texts, can be characterized by three elements:

1. It is based on the rule of law. This contrasts with a society that has no rule of law (the state of nature).
2. It is socially located in between the state and the market such that contestations between the state and the market will affect civil society. In some cases, civil society organizations might be seen as the long arm of the market, such as business associations or entrepreneurial organizations. In other cases, civil society organizations might be considered as the long arm of the state, such as in the case of government-owned non-governmental organizations (GONGO) (Hashmat et al., 2019). Salamon et al., in portraying this space between the state and the market, coin the term "the third sector" (Salamon & Anheier, 1997).
3. Voluntary associative relationships dominate civil society. Consequently, civil society is a sphere of free public debate. However, it is essential to note that the notion of "association" cannot simply replace civil society since any association is influenced by either the market or the state (Warren, 1999).

Now that we have defined the characteristics of civil society, I will turn to the notion of governance and then discuss its relationship with civil society.

15.3 Characterizing Urban Environmental Governance

As mentioned in the previous section, civil society has constantly changed. To understand how this new role was affected by the changes in government, we need to characterize the concept of governance, focusing on environmental governance in an urban context because this is the object of our analysis.

15.3.1 From Government to Governance

Steer, guide, direct, control, regulate, influence, and determination are synonymous with "to govern." In the first generation of modernity (after World War II), the term "govern" was explicitly characterized as a nation-state centered process (Arts & Van Tatenhove, 2006). In other words, governing was to rule or exercise authority and administer the affairs of the state, and traditionally referred to as "the formal institutional structure and location of authoritative decision making" (Stoker, 1998, 34–51). However, this traditional-hierarchical way of governing was challenged in the second half of the previous century. The state was no longer seen as the sole "container" of political life and the sole owner of power to govern society (Ruzza, 2006, 169–196). The development of neo-liberalism limited the role of the state and

meant that the private sector obtained more opportunities to provide services that previously were provided by the state.

New social movements put further pressure on governments to allow other parties (e.g., civil society) to claim authority over certain aspects of public life. For instance, the informal civil society movement in Ukraine (EuroMaidan) turned into a formal institution that pushed the government to pay more attention to its voice (Krasynska & Martin, 2016).

The ongoing globalization of the market economy has been another factor that forced many states to transform their system of governing society. In the era of globalization, a state can no longer entirely control and govern everything within its territory unless the country is completely isolated from the rest of the world. The need to cooperate with other parties inside or outside the state's boundaries has replaced "monolithic state governance" with "network governance" (Arts & Tatenhove, 2006).

In sum, three factors changed the government system into a governance system in many countries over the past 50 years: (1) the demise of the traditional-hierarchical organization of society; (2) upcoming neoliberalism; and (3) the globalization of the economy.

These three factors did not affect all countries to the same degree. They especially had a marked influence on the Western industrialized countries, but upcoming economies like Indonesia were equally influenced by neoliberalism and globalization. These worldwide changes set the stage for our definition of "governance."

Mayntz asserted that "governance" in English is equivalent to "governing," a term that refers to the process of government. Therefore, governance is what the government does; it complements government (Mayntz, 1998). In other words, governance refers to the dynamics of the state. Pierre, however, suggested that governance has a dual meaning. On the one hand, it is an "empirical manifestation of state adaptation" to its current external environment. On the other hand, governance is seen as "a conceptual or theoretical representation of co-ordination of social systems." For the most part, it coincides with the role of the state (Pierre, 2003,3).

Furthermore, in elaborating the latter denotation, Peter discerns two aspects of governance (Peter, 2000, 3). The first is the so-called traditional steering conception of governance, which deals with the capacity of the central government to control the government itself, the economy, and society. In this conceptualization, governance focuses on the government itself as the center of the study. The second aspect of governance, according to Peter, is the so-called "new/modern governance," which focuses more on the question of how the central government interacts with society aiming to reach consensus or how a self-steering and self-regulating society might emerge. It then focuses on a dynamic situation in which civil society interacts with other actors in governing society. As Mayntz argues, governance indicates a new mode of governing where state and non-state actors participate in mixed public/private networks (Mayntz, 1998).

Stoker, quoting the work of Rhodes, agrees that governance signifies "a change in the meaning of government, referring to a new process of governing" (Stoker, 1998b, 34–51). Although he also mentions that the outcomes of governance are no

different from government outcomes. Instead, the difference lies in the process of governing. Stoker emphasizes that governance refers to the participatory mechanism in which the boundary between the public and private sectors is blurred so that it will not depend on the authority and sanction of the government alone (Stoker, 1998a).

In the same spirit, Jessop defines governance as "the complex art of steering multiple agencies, institutions, and systems which are both operationally autonomous from one another and structurally coupled, through various forms of reciprocal interdependence" (Jessop, 1997, 95). Similarly, Hirst points out that "governance relates to the new practices of coordinating activities through networks, partnerships and deliberative forums" (Hirst, 2000, 18). It is clear then that governance also refers to the existence of networks, which typify complex societal problems. Rhodes underscores that "networks are the analytical heart of the notion of governance in the study of public administration" (Rhodes, 2000, 57).

Because governance relates to the network structure of society, it emphasizes actors that are involved, the power interdependencies among them, the types of networks they belong to, the depth of the democratic level, and how such mechanisms may reach the common goals of the connected societal network.

The fact that governance always involves a network is reinforced when power is transferred away from the central government. The public demand for a more accountable government has resulted in the belief that the closer a government is to the people, the more accountable it will be. Therefore, many governments are now sharing more power and are allocating their service delivery increasingly to local governments. As a result, many new branches of local governance emerge as a more autonomous mode of governing. This process has been especially obvious in Indonesia since 1998.

It must be noted that the network character of governance does not have a single meaning either. The type of network varies from one case to another depending on the power relationships among the actors. In some cases, governance leans toward market-driven networks in which private actors dominate the network, whereas community-oriented networks might emerge in other instances.

To sum up the above discussion, governance can be characterized as (1) a mode of governing society; (2) involving multiple actors in multi-level forms and roles in the networks; (3) resulting from a change in the political reality both locally and internationally; and (4) aiming to achieve common societal goals.

In the field of urban governance, Digaetano and Klemanski found that the urban policy agenda is mainly steered by a coalition of government officials, business leaders, and community activists (Digaetano & Klemanski, 1999, 8–9). This triangle among government, market, and civil society is therefore used in this paper as a model to understand the interaction of actors in urban governance.

15.3.2 Urban Environmental Governance

Many environmental issues occur in the city due to the increasing migration of people to the city. This has created changes in the ecosystem that must support life in the city. Like urban governance implies a territorial limitation, so is urban environmental governance limited by a thematic reach, as it is restricted to environmental issues (Schroter et al., 2005, 1333–1337).

There is an increasing need to develop new approaches to strategic planning, decision-making processes, the integration of entrepreneurship, and, thus, a need for more innovative modes of governance. Therefore, a new, hybrid concept of governance is needed (Frantzeskaki, 2016, 1–6).

In briefly discussing this, the urban environmental governance concept uses three different approaches to achieve environmental goals: (1) command and control; (2) economic instruments; and (3) voluntary means.

The first approach is through command and control. Dryzek asserts that the command and control approach manifests itself in several practices, such as developing professional resource management bureaucracies based on scientific principles rather than political expediency (Dryzek, 1997).

Environmental governance, in this sense, relies on regulation and enforcement. Government is then defined as the party that has the authority to control, manage, and tackle environmental problems by depending on what the government's experts say.

The second approach to environmental problems consists of so-called "economic instruments." Yandle, in quoting Reilly, asserts that "the forces of the marketplace are powerful tools for changing individual and institutional behavior." this approach gained currency after the decline of communism and the emergence of the free market economy as a new way society could be governed (Yandle, 1993, 185–207).

Supporters of the guiding capacity of market forces believe that the best mechanisms that protect the environment consist of producer-consumer relationships and seller-buyer relationships. The notion of property rights plays a vital role in the economic instruments of environmental governance. It is believed that people will care more about their personal belongings than about common or public belongings.

These mechanisms show that governance is more than government, although the two might cover much of the same ground. While some of the mechanisms discussed may seem external to the government, the regulatory power and significant fiscal responsibility are still in the hands of the government (Saunier & Meganck, 2004, 9).

A third mechanism consists of so-called "voluntary means." As a result of the emergence of the democratic wave, which was proclaimed "the end of history" by Fukuyama (Fukuyama, 1992). Many countries are now opening their doors to allow their citizens to participate in the governing processes.

Concerning urban environmental protection, citizen participation in the governing process focuses on the role of individuals, or groups of individuals, who are aware of environmental problems.

Many public participation tools have been introduced to engage citizens in policymaking from the planning stage up to the evaluation of the program. In 2001 the United Nations Center for Human Settlements (Habitat) released at least 18 toolkits to involve the public in urban decision-making processes (UNCHS, 2001, 17–98). These toolkits are part of the Global Urban Governance Campaign, which provides a directory and a referral facility for city governments, or municipalities, wishing to improve their governance processes.

To sum up this section, urban environmental governance aims to balance environmental protection, economic growth, and community development. It can be characterized as a process of governing society through three pillars: the state, the market, and civil society, where the inherent, main instruments are the use of command and control, the use of economic instruments, and the use of voluntary means, respectively. The process of urban environmental governance may use three different methods: command and control, economic instruments, and voluntary means. In all three, the tenet is "advancing the understanding of drivers and processes shaping environmental governance of the cities." (Frantzeskaki, 2016,2), examining how the system supports the livability and sustainability of urbanized people and designing and employing inclusive policy and planning practices (Gerometta et al., 2005).

15.4 The Role of Civil Society in Urban Environmental Governance

Stoker emphasizes that governance refers to the participatory mechanism by which the boundary between the public and private is blurred so that any outcome will not depend on the authority and sanction of the government alone (Stoker, 1998b). Governance, then, is a result of the interaction of multiple governing and mutually influencing actors (Kooiman & Van Vliet, 1993, 64).

Stoker suggests five propositions as aspects of governance (Stoker, 1998a): (1) Governance refers to a complex set of institutions and actors that are drawn from but also beyond government; (2) Governance recognizes the blurring of boundaries and responsibilities to tackle socio-economic issues; (3) Governance identifies the power dependence involved in the relationships between institutions engaged in collective action; (4) Governance is about autonomous self-governing networks of actors; and (5) Governance recognizes the capacity to get things done, which does not rest on the power of the government to command or use its authority.

In my analysis of urban environmental governance, I will use Stoker's five prepositions as aspects of governance. In his characterizations, civil society may be viewed as a democratic agent needed to stabilize democracy within the state. The freedom within civil society and inter-social groups will prevent the domination of any group (even of the state or the market) over others.

Based on his study of Indonesian NGOs during the authoritarian regime under Soeharto, Fakih coined the so-called reform paradigm of civil society. In this

paradigm, the state is monitored "wisely" by civil society so that, to some extent, civil society controls the state. In this paradigm, however, this means that the stronger the state is, the weaker civil society will be (Reed, 2010, 646–653). Before the Reformasi, the pressure of civil society on the state tended to be moderate. Instead of influencing the state from outside, civil society was co-opted by the state and, in the long run, became an instrument of the state, thereby losing its control function (Fakih, 1996).

Having said this, civil society as an autonomous institution may be considered as an *autopoiesis*. Coined by two biologists, Maturana and Varela, their concept of *autopoiesis* was borrowed to frame the dynamic evolutionary process within civil society itself and its role in shaping environmental governance. The authors propose that "everything in a biological system is the product of the evolution of that system" (Maturana & Varela, 1987). Within the context of this research, my work focuses on the role of civil society as a promoter of development and a crucial agent in controlling the government. The role and contribution of civil society will then shape and be shaped by the result of the governing process.

15.5 Governance by Accident?

The notion of governance emphasizes the roles of various actors in creating a better process of governing society when seeking to achieve specific shared goals. In doing so, the involvement of civil society is inevitable since, in a broader sense, civil society can be defined as all entities outside the state and the market. When civil society organizations are perceived as organizations outside the state and the market system, their role can be seen as both opposing as well as supporting the state and the market, the other two pillars of governance. On the one hand, civil society is important when functioning as an opponent of the state since this will strengthen the checks-and-balances mechanism. On the other hand, when it supports the state, civil society has an essential role in filling the gaps that cannot be replenished quickly by the state or the market.

Moreover, this paper focuses on the power dependence of institutions involved in collective actions on their autonomous self-governing networks of actors. The question is whether there is the capacity to protect the environment without depending on the government's command or authority. This is a crucial question since the involvement of civil society was not deliberately designed by the government. Instead, civil society becomes engaged because it considers it essential to be involved.

I put this in the context of solid waste collection in Indonesia. In general, the flow of solid waste transfer in Indonesia occurs as below (Fig. 15.1).

The Indonesian Law on Waste does not mention how the waste should be transferred from the sources of garbage to the Final Disposal Site. In reality, the office of sanitation of each municipality or other similar office (due to the decentralization law, each city might have a different name of the institution that handles waste) only

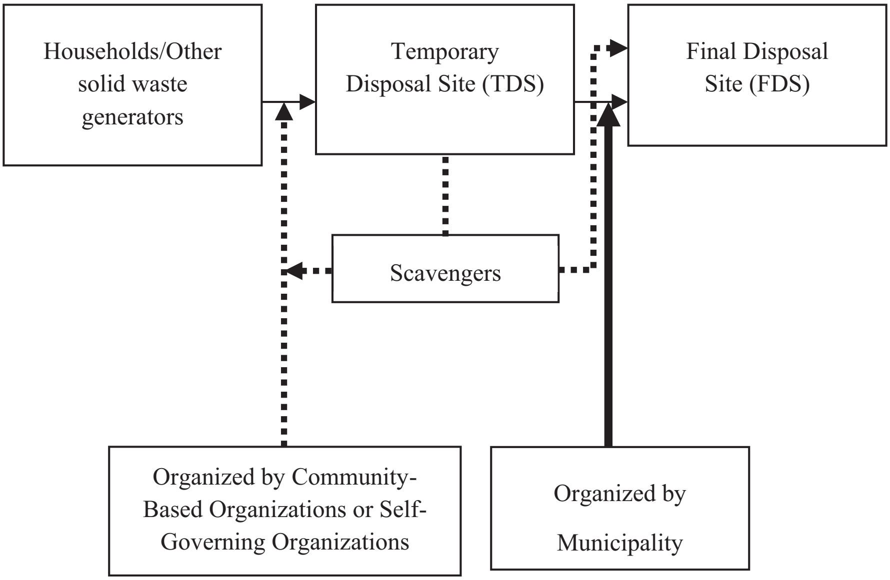


Fig. 15.1 The flow of solid waste transfer in Indonesia

transfers the waste already placed in the Temporary Disposal Sites to Final Disposal Site. People have to arrange their waste transfer from the sources of waste, either households or offices. It is expected that community-based organization (CBO) such as *Rukun Tetangga* (Neighborhood Watch) is the arranger of this waste transfer from each household to temporary disposal sites. Some CBOs even establish a waste bank for organic waste to compose them and turn them into fertilizers.

The other important actors involved in the waste transfer are the scavengers. They are persons who take valuable garbage and sell them to be recycled or reused by factories. They pick up cardboard, papers, bottles (either plastic or glass), and metal scraps. These scavengers collect garbage from households/offices, temporary disposal sites to the final disposal site.

The involvement of community-based organizations, let alone the scavengers, is not designed. Thus, the participation of civil society in shaping environmental governance is not a deliberate action by design, but to a certain extent, this occurs without being planned. Despite the fact that the number of civil society organizations that deliver public services is rising (Foo, 2018), the main question remains whether civil society organizations and in particular CBOs and environmental civil society organizations will fill the gaps created by the government.

15.6 Conclusion

In conclusion, the study found that, firstly, the wave of democratization created new possibilities for civil society to articulate its interests. At the beginning of the democratization process, civil society was seen as an entity opposing political society, i.e., the government. As a result, this changed the nature of government rule. Shifting from government to governance can only happen if civil society movements become more active and influential. Civil society should put political pressure on the government as a voluntary movement. When this takes place, it is expected that the government will be forced to alter its regulations to accommodate the involvement of civil society.

Secondly, the increasing power of civil society to pressure the government also changed the internal relationships among national, provincial, and local tiers of government. The various amendments and changes in the acts pertaining to local government showed that the locus of political power kept moving between the national, provincial, and local tiers of government. These changes in the decentralization policy reflected the political contestation among the actors involved, including civil society.

Finally, the study concluded that the variety of civil society organizations and the degree of their involvement shaped environmental governance. The roles of civil society, as mentioned earlier, need not be interpreted as if one civil society movement employs one single role. Instead, it must be understood that a civil society organization can perform all these roles. The more intensive the involvement of civil society, the more likely the government will respond to the problems brought to the attention of the local authorities. The study demonstrated how the application of these roles led to civil society organizations acting as service providers, providers of finance, and policy influencers in order to shape urban environmental governance. However, the dynamic role of civil society in shaping urban environmental governance does not "by design" as it happens in the western world. It is done by accident.

References

Amin, & Hausner, J. (Eds.). *Beyond market and hierarchy: Interactive governance and social complexity* (p. 95). Edward Elgar.

Anheier, H. K. (2014). Civil society research: Ten years on. *Journal of Civil Society, 10*(4), 335–339.

Arato, A. (2000). *Civil society, constitution, and legitimation*. Rowman and Littlefield Publishers Inc.

Arts, B., & Van Tatenhove, J. (2006). Political modernisation. In B. Arts & P. Leroy (Eds.), *Institutional dynamics in environmental governance*. Springer.

Beem, C. (1996). *Civil society in America: A public debate about political theory*. Retrieved on December 13, 2004, from http://www.americanvalues.org/html/wp_52.html

Bestor, V. L. (2004). *Reimagining "Civil Society" in Japan*. Retrieved on December 14, 2004, from http://www.us-japan.org/dc/cs.bestor.paper.htm

Booth, A. (2003). Decentralization and poverty alleviation in Indonesia. *Environment and Planning C: Government and Policy, 21*, 181–202.

Cohen, J. L., & Arato, A. (1992). *Civil society and political theory*. The MIT Press.

Colas, A. (2002). *International civil society*. Blackwell Publishers.

Digaetano, A., & Klemanski, J. (1999). *Power and City governance: Comparative perspectives on urban development* (pp. 8–9). University of Minnesota Press.

Dryzek, J. (1997). *The politics of the earth: Environmental discourse* (p. 64). Oxford University Press.

Aspinall, E., & Fealy, G. (Eds.). *Local power and politics in Indonesia* (pp. 179–193). Institute of Southeast Asian Studies.

Fakih, M. (1996). *Masyarakat sipil*. Pustaka Pelajar.

Ferguson, A. (1809). *On the History of Civil Society*. Boston: Hastings, Etheridge and Bliss. E-book version was retrieved March 25, 2005, from https://books.google.bi/books?id=BeEvAAAAYAAJ&hl=fr

Foo, K. (2018, July). Examining the role of NGOs in urban environmental governance. *Cities,* 77, 67–72. Retrieved on December 19, 2019, from https://doi.org/10.1016/j.cities.2018.01.002

Frantzeskaki, N. (2016). Advancing urban environmental governance: Understanding theories, practices, and processes shaping urban sustainability and resilience. *Environmental Science and Policy, 62*, 1–6.

Fukuyama, F. (1992). *The end of history and the last man*. The Free Press.

Gerometta, J., Haussermann, H., & Longo, G. (2005). Social innovation and civil society in urban governance: Strategies for an inclusive city. *Urban Studies, 42*(11), 2007–2021.

Gleason, G. *"Asian values" and the democratic transition in Central Asia*. Retrieved on October 31, 2003, from http://www.fas.harvard.edu/˜asiactr/haq/200101/0101a002.htm

Green, A. (1999). A cross-regional analysis of civil society and democratic development. *CIAO, 2*.

Habib, A., & Kotze, H. (2002). *Civil society, governance, and development in an era of globalization*. Unpublished manuscript.

Han, H. (2014). Policy deliberation as a goal: The case of Chinese ENGO activism. *Chinese Political Science, 19*, 173–190.

Hasmath, R., Hildebrandt, T., & Hsu, J. Y. J. (2019). Conceptualizing government-organized non-governmental organizations. *Journal of Civil Society*, *15*(3), 267–284. Retrieved on July 5, 2019, from https://doi.org/10.1080/17448689.2019.1632549

Hellyer, H. A. (2015). *Adelphi Series, 55*(453–454), 131–150.

Hirst, P. (2000). Democracy and governance. In J. Pierre (Ed.), *Debating governance: Authority, steering and democracy* (p. 18). Oxford University Press.

Jessop, B. (1997). The governance of complexity and the complexity of governance: Preliminary remarks on some problems and limits of economic guidance.

Kooiman, J., & Van Vliet, M. (1993). Governance and public management. In K. Elliasen & J. Kooiman (Eds.), *Managing public organizations* (2nd ed., p. 64). Sage.

Krasynska, S., & Martin, E. (2016). The formality of informal civil society: Ukraine's EuroMaidan. *International Society for Third Sector Research, Voluntas, 28*, 420–449. https://doi.org/10.1007/s11266-016-9819-8. Published online 9 December 2016.

Lewis, D. (2001). *Civil society in non-Western context: Reflections on the 'usefulness' of a concept*. Unpublished manuscript. London. Retrieved March 25, 2005, from http://eprints.lse.ac.uk/29052/1/CSWP13_web.pdf

Lim, J. H., & Shui-Yan, T. (2002). Democratization and environmental policy-making in Korea. *Governance: An International Journal of Policy, Administration and Institutions, 15*(4), 561–582.

London School of Economics (LSE). (2001). *How to measure civil society*. Retrieved on December 13, 2004, from http://fathom.lse.ac.uk/features/122552

Macedo, S. (2001). The constitution, civic virtue, and civil society: Social capital as substantive morality. *Fordham Law Review, 69*(5) Retrieved on November 15, 2011, from https://ir.lawnet.ford-ham.edu/flr/vol69/iss5/2

Marie Curie Working Papers, Department of International Politics, University of Wales, Aberystwyth. Retrieved November 15, 2015, from https://www.researchgate.net/publication/263846854
Maturana, H. R., & Varela, F. J. (1987). The Tree of Knowledge: The Biological Roots of Human Understanding. Boston: Shambhala Publications Inc. Quoted in Van Assche, K., Beunen, R., & Duineveld, M. (2014). *Evolutional Governance Theory: An introduction* (p. 9). Springer Briefs in Economics. Heidelberg: Springer International Publishing.
Mayntz, R. (1998). *New challenges to governance theory*. European University Institute, Jean Monet Chair paper RSC no 98/50. Retrieved on July 30, 2005, from http://www.uned.es/113016/docencia/spd%20doc-torado%202001-02/Introducci%F3n/Mayntz%governance%20EUI%201998.htm
O'Donnell, G. (2002). In partial defense of an evanescent "paradigm". *Journal of Democracy, 13*(3), 6–12.
O'Brien, R. (1999a). *Philosophical history of the idea of civil society*. Retrieved on September 11, 2004, from http://www.web.net/~robrien/papers/civhist.html
O'Brien, R. (1999b). *Philosophical history of the idea of civil society*. Retrieved (again) on May 18, 2018, from http://www.web.net/~robrien/papers/civhist.html
Ostwald, K., Tajima, Y., & Samphantharak, K. (2016). Indonesia's decentralization experiment: Motivations, successes and unintended consequences. *Journal of Southeast Asian Economies, 33*(2), 139–156.
Peter, B. G. (2000). Governance and comparative politics. In J. Pierre (Ed.), *Debating governance: Authority, steering, and democracy* (p. 36). Oxford University Press.
Pierre, J. (2000). Understanding governance. In J. Pierre (Ed.), *Debating governance: Authority, steering, and democracy* (p. 3). Oxford University Press.
Pietrzyk, D. (2001). Civil society – A conceptual history from Hobbes to Marx. *International Politics, 1*, 1–54.
Raska, F. D. (2017). Civil society in Putin's Russia. *The European Legacy, 22*(1), 109–110.
Reed, M. G., & Bruyneel, S. (2010). Rescaling environmental governance, rethinking the state: A three-dimensional review. *Progress in Human Geography, 34*(5), 646–653.
Rhodes, R. A. W. (2000). Governance and public administration. In J. Pierre (Ed.), *Debating governance: Authority, steering, and democracy* (p. 57). Oxford University Press.
Rosenblum, N. L., & Post, R. C. (Eds.). (2002). *Civil society and government*. Princeton University Press.
Ruzza, C. (2006). European institutions and the policy discourse of organized civil society. In S. Smismans (Ed.), *Civil society and legitimate European governance* (pp. 169–196). Edward Elgar.
Salamon, L. M., & Anheier, H. K. (Eds.). (1997). *Defining the nonprofit sector: A cross-national analysis*. Manchester University Press.
Saunier, R. E., & Meganck, R. A. (Eds.). (2004). *C.H.A.O.S.S.: An essay and glossary for students and practitioners of global environmental governance* (p. 9). A.A. Balkema Publishers.
Schlesinger, P. (2010). In Q. Hoare & G. Nowell-Smith (Eds.), Selections from the prison notebooks of Antonio Gramsci. *International Journal of Cultural Policy, 1*(16), 72–73. https://doi.org/10.1080/10286630902952421
Schroter, D. W., Leemans, R., Prentice, I. C., Araujo, M. B., Arnell, N. W., Bondeau, A., Bugmann, H., & Carter, Scott, S. J. (2003). From Benin to Baltimore: Civil society and its limits. *The International Journal of Not-for-Profit Law, Six (One)*.
Stoker, G. (1998a). Governance as theory: Five propositions. ISSJ 50(155), 17,. UNESCO. Oxford: Blackwell Publishers.
Stoker, G. (1998b). Public-private partnerships and urban governance. In J. Pierre (Ed.), *Partnerships in urban governance: European and American Experiences* (pp. 34–51). Basingstoke.
T.R. (2005). Ecosystem service supply and vulnerability to global change in Europe. *Science, 310*(80), 1333–1337.
The Republic of Indonesia (RoI), The Act No 22 of the Year 1999 on the Regional Autonomy.

The Republic of Indonesia (RoI), The Act No 32 of 2004 on Local Government.
United Nations Centre for Human Settlements (UNCHS). (2001). *Tools to support participatory urban decision making* (pp. 17–98). UNCHS Habitat.
Warren, M. E. (1999). *Civil society and good governance*. Unpublished manuscript. Washington, DC. Retrieved March 25, 2008, from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.388.8418&rep=rep1&type=pdf
Widodo, A. (2003). *Changing the cultural landscape of local politics in post-authoritarian Indonesia: The view from Blora Central Java*.
Yandle, B. (1993). Community markets to control non-point source pollution. In R. E. Meiners & B. Yandle (Eds.), *Taking the environment seriously* (pp. 185–207). Rowman and Littlefield.

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Chapter 16
Water Resources Governance in Indonesia Towards Environmental Sustainability Along with Social and Economic Development

Andi Setyo Pambudi and Trikurnianti (Yanti) Kusumanto

Abstract Indonesia's water resources governance aims at delivering the basic needs of a growing population whilst being constrained by ecosystems' carrying capacity. The main causes of regulatory overlaps and prevalent "silo mentality" in water governance are sought by analysing laws, regulations, and policies. Over time, water resources governance has aimed to address food, water, and energy needs through infrastructural approaches, forest and land rehabilitation, and community participation. It is anchored in the river basin territory and watershed concepts. Public decision-making, however, puts anthropogenic considerations at its core rather than hydrological aspects, leading to misfits between institutions and ecosystem functioning. Ineffective legal instruments and policies are essentially due to institutional constraints. A synthesis of the three major water regulations—Government Regulation 37/2012 concerning Watershed Management, Law 17/2019 concerning Water Resources, and Government Regulation 26/2008 concerning National Spatial Plan—reveals little ownership of watershed management with regional/local governments since responsibilities are delegated by the central government to a technical agency; limited focus on *green water* (social and ecological) governance approaches compared with *blue water* (hard infrastructural) ones; and weak law enforcement and formulation of strategies for maintaining ecosystem functioning. Our recommendations include an *ecoregional water governance* with a thoroughly designed performance and target indicators; continuation of develop-

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ment plans built on previous plans and outcomes; continuity in water resources monitoring and evaluation; society-wide participation; and synchronisation of regulatory processes of all administrative levels led by the President in collaboration with Parliament using “carrot and stick” modes.

Keywords Ecoregion · Ecosystem · Environmental governance · Forest management · Indonesia · Public participation · River basin territory · Sustainable development · Water infrastructure · Water regulations · Water resources governance · Watershed

16.1 Introduction

Water governance in Indonesia is greatly challenged by a misalignment of environmental sustainability and social and economic development objectives. It is weakly apt for the deliverance of the basic needs of a growing population whilst being constrained by ecosystem’s carrying capacity. The country’s increasing population (Pambudi, 2020) means increased demands on water sources for meeting basic human needs (Bellfield et al., 2016). Furthermore, growing demands on raw water have been due to recent acceleration in economic growth driven by increased industrial, service and urban activities (Maheshwari et al., 2016; Bappenas, 2015; Fulazzaky, 2014). This has manifested itself in the doubling to tripling of water demands and prioritisation of water security in Indonesia’s development agenda. The water security challenge is expected to continue until at least 2045.[1] Another challenge concerns a water quality decline that has occurred since 2015 (Bappenas, 2019).

Major water governance issues are often connected to the conservation, utilisation and/or quality of water. Water conservation, particularly, is central for achieving sustainable development and supporting related sectors (Pambudi, 2019). Water conservation policies are often applied to watersheds and their ecosystems and have therefore a hydrological perspective in supporting socio-economic activities in rural and urban areas (Pambudi, 2019; Lubis et al., 2018; Maheshwari et al., 2016). These policies—covering the protection and preservation of water resources, as well as the management and control of water quality—are usually integrated with other development sectors including forestry, environment, public works, agriculture, and plantations. Hence, policies in these areas can significantly affect watershed functioning.

[1] The availability of water in some islands and regions has come under strain, particularly on Java, where water resources are classified as under threat, and on Bali and Nusa Tenggara, where they are considered under pressure.

Indonesia's National Medium-Term Development Plan (RPJMN) 2020–2024 accommodates the integration of above-mentioned policy areas through the three pillars of *infrastructure*, *ecosystems,* and *social institutions*:

1. Infrastructures are facilitated through the construction and rehabilitation of water reservoirs, ponds, reservoirs, and lakes.[2]
2. Ecosystems are addressed through measures that improve watershed ecosystems and through forest and land rehabilitation and spatial planning initiatives that engage communities. These measures and initiatives include the advancement of availability and quality of water resources.
3. Social institutions are involved through measures that facilitate community participation in watershed management, particularly by coordinating between sectors and action plans contained in regional and local spatial plans (RTRW), watershed management plans (RPDAS), and water resources schemes (Pola SDA) (Bappenas, 2015).

Despite national policies that are intended to integrate policy areas, watersheds continue to experience damage and decline in quality.[3] Although issues related to ecology, hydrology, economics, and other relevant disciplines are interconnected, policies developed to address these are fragmented and fall under distinct sectoral—hence jurisdictional—regulations and responsibilities. We refer to this phenomenon as *sectoral egoism* or *sectoral silo mentality,* that is whereby distinct sectors and institutions function as if they protect their own sectoral interests. Policy fragmentation can also result from overlaps of or gaps in sectoral mandates for formulating regulations and action plans. The regulatory context of water resources is characterised by a vast plethora of legal instruments that cover many aspects of human activity. Such a context can stimulate overlaps of and contradictions between different regulations.

This chapter seeks to identify the root causes of prevalent *silo mentality* in Indonesian water resources governance and what implications these entail from environmental, social and economic perspectives. As main method we analyse relevant Indonesian water resources laws, regulations and policies, which is supported by insights found in the literature and official documents.[4] In the sections that follow, the chapter starts with an overview of the history, foundational concepts, and legal and institutional measures of Indonesian water resources governance (Sect.

[2] Presidential Regulation 18 of 2020 (Annex 16.1).

[3] These can be measured by using indicators of erosion and sedimentation rates due to land use change in upstream areas resulting from agriculture, plantations, and human settlements. Furthermore, hydrological indicators also show significant fluctuations in river discharge levels in the rainy and dry seasons as well a decline in water quality (Razali et al., 2018; Reddy et al., 2017).

[4] These include the Laws and Regulations as listed in Annex 16.1; reviewed official documents were: Integrated Watershed Management Plans, management plans on water resources from riverine areas, monitoring and evaluation documents related to watersheds, regulations and work plans of regional/local governments including those issued by governors and district heads/mayors, regional agencies, and district offices.

16.2). A synthesis follows of its major regulations, policies, and planning aspects as well as the challenges confronting these (Sect. 16.3). "A way forward" concludes with suggestions and recommendations for addressing the challenges discussed (Sect. 16.4).

16.2 Overview: History, Concepts, and Legal and Institutional Measures

16.2.1 Water Governance Policies Over Time

Since colonial times until the 1980s, Indonesian water governance policies had emphasised the protection of water resources by applying technical, civil engineering approaches. The central aim had been to increase food production and address food shortages. Reservoirs, dams and weirs were constructed and expanded to ensure water availability for agricultural irrigation (Bappenas, 2019). Under Sukarno (1945–1967), water conservation facilities were developed in swampy areas of Kalimantan deploying the Dutch polder[5] system, besides the construction of major dams on Java.[6] Also Suharto (1967–1998) constructed large dams and reservoirs, namely to achieve food self-sufficiency. Suharto even intensified infrastructural development supported by foreign loans. In the post-Suharto period, infrastructural development continued and by 2000 more than 36,500 dams and 219 reservoirs had been developed for ensuring water supply for settlements, agriculture, industry and other purposes (Sutardi, 2002). Incumbent President Joko Widodo (Jokowi) sees infrastructural development as strategy to meet the country's food needs.

Under Sukarno's presidency through the post-Suharto period, water governance policies had also entailed the rehabilitation of degraded land, besides infrastructural development. These included the planting of perennials—referred to as vegetative approach—in state forest areas and on community-owned land (Bappenas, 2019). Over time, an area of approximately 110,000 hectares of degraded land was reforested (Chen et al., 2016). The approach aimed to maintain optimal levels of soil fertility and improve the hydrological cycle of watersheds. The vegetative approach was incorporated by Suharto in Indonesia's five-year development plans, also known as REPELITAs. The fifth REPELITA expanded forest and land

[5] A polder is a low-lying tract of land that forms an artificial hydrological entity, enclosed by embankments known as dikes. The ground level in drained marshes subsides over time. All polders will eventually be below the surrounding water level some or all of the time. Water enters the low-lying polder through infiltration and water pressure of groundwater, rainfall, or transport of water by rivers and canals. This usually means that the polder has an excess of water, which is pumped out or drained by opening sluices at low tide (Reh et al., 2007).

[6] These include Jatiluhur (West Java) and other dams, such as along Citarum River (West Java and Greater Jakarta) and along Brantas River (East Java).

rehabilitation programmes to include also rehabilitation initiatives conducted by communities, including the involvement of women and youth (Nawir et al., 2008). In the decentralised post-Suharto period, regional/local governments played an increasingly important role in forest and land rehabilitation,[7] addressing critical land in state forest and on privately owned land.[8]

The development of infrastructural works and facilities for water resources conservation with a technical, civil engineering approach was the responsibility of the Ministry of Public Works and Housing (MoPWH). To a lesser extent, the Ministry of Environment and Forestry (MoEF) was also involved in similar civil engineering projects.[9]

16.2.2 Conceptual Foundations: River Basin Territory and Watershed

Indonesian laws, regulations and policies pertaining to water resources are conceptually based on the categorisation into water zones according to particular scientific disciplines. The determination of water zones uses either a morphological (hydraulic), ecological, or anthropogenic—associated with the role and involvement of humans—perspective. A combination of one or more perspectives—e.g., eco-hydraulic—can also be applied. The latter categorisation is less common.

Before the 1980s, water resources governance predominantly referred to the concept of river basin territory (RBT). The categorisation to RBTs is based on morphology and thus follows a hydraulic perspective, as well as designates rivers as *blue water* (Chen et al., 2016). Water from this perspective runs off along streams and rivers or percolates into groundwater aquifers. River water areas can be distinguished into zones consisting of still water areas and dynamic water areas.[10]

Since the 1980s, due to evolving scientific and operational knowledge, different perspectives may more or less be integrated. The eco-hydraulic perspective, for example, considers besides the physical-hydraulic aspects also the ecological

[7] A major initiative was the National Movement for Forest and Land Rehabilitation Programme (Gerakan Nasional Rehabilitasi Hutan dan Lahan or GERHAN), established in 2003.

[8] GERHAN was allocated 5.9 trillion Indonesian Rupiahs with a targeted planting area of 3,000,000 hectares. In 2003 the programme was implemented in 15 provinces including 26 watersheds. It was expanded in 2004 to 31 provinces including 141 watersheds (Santoso, 2005). From 2008 onwards, land and forest rehabilitation programmes were also financed from so-called Special Allocation Funds (Dana Alokasi Khusus –DAK) for implementation by regional/local governments.

[9] The construction of dams, check dams, reservoirs and water reserves was also implemented by the MoEF, while MoA was involved in the development of check dams, rehabilitation of land and water management systems, as well development of ground and surface water irrigation systems.

[10] Still, that is not flowing, water areas include lakes, dead rivers, dams, swamps, and river branches that only flow in the rainy season. Flowing or dynamic water territories include water bodies such as underground rivers, surface rivers, and seas with their currents.

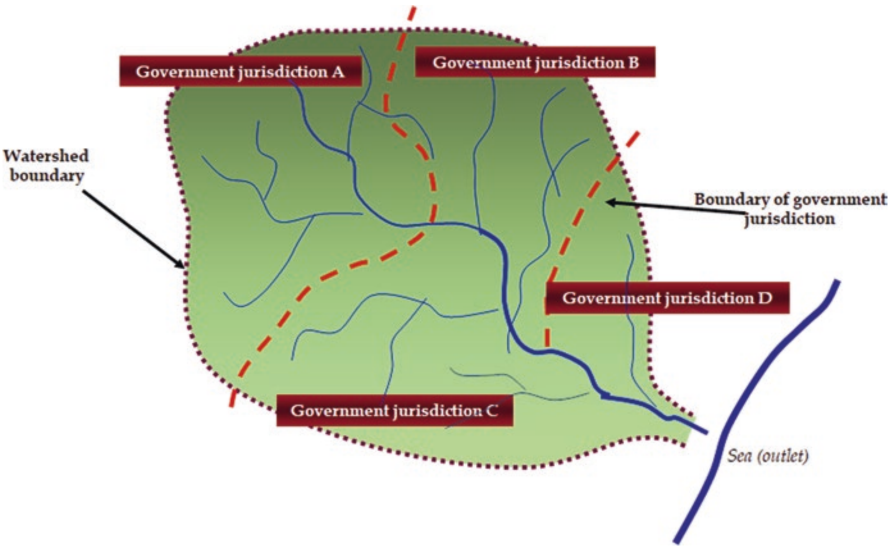


Fig. 16.1 Simplified illustration of a watershed. (Based on Government Regulation 37 of 2012, Law 23 of 2014, Law 37 of 2014, and Law 17 of 2019)

perspective. From an ecological viewpoint, the concept of RBT cannot be viewed apart from the watershed idea. Watersheds include rivers and their tributaries as well as the land around them as one entity (Fig. 16.1). This land surface contains, stores, and directs the flow of water derived from precipitation into lakes or seas without human intervention. The watershed concept embraces the *green water* idea. Differently from *blue water*, *green water* is the portion stored in soil and is potentially available for uptake by plants (Chen et al., 2016). A watershed can consist of more than one sub-watershed. An RBT can contain more than one watershed and/or small islands surrounded by water (Fig. 16.2).[11] Changes to a watershed will affect the RBT of which it is part. The watershed area contains all water flows that enter the watershed zone due to rainfall and according to the hydrological cycle. The different parts of a watershed form an energy chain in the ecosystem from upstream to middle and downstream areas. It is therefore crucial that the governance of water resources considers all parts of a watershed as interconnected parts of the entire watershed. Indonesia's water governance, however, puts anthropogenic considerations at the core of decision-making, rather than the hydrological aspects. A watershed is often viewed as an administrative unit for watershed management. This can create problematic situations at the implementation level.

[11] By law, a River Basin Territory has an area of one or more watersheds and/or small islands, of which each is less than or equal to 2000 square kilometres.

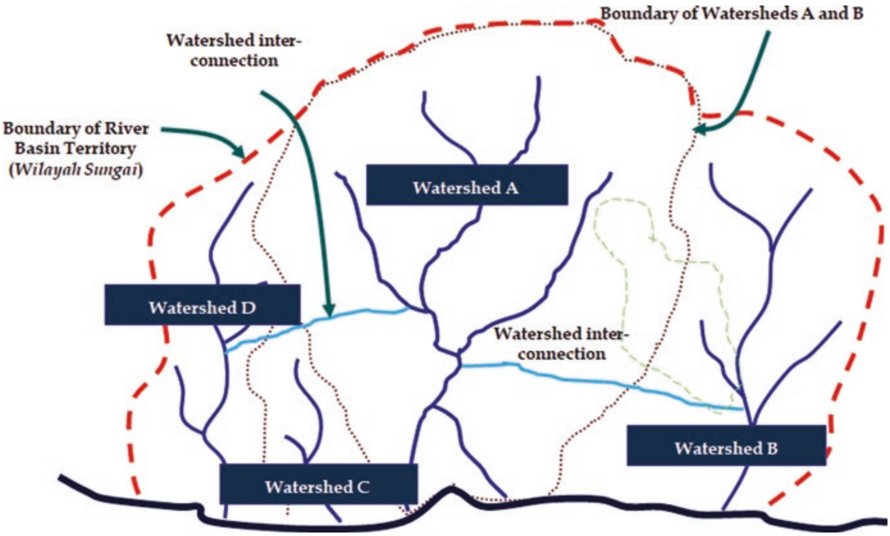


Fig. 16.2 Simplified illustration of a River Basin Territory (RBT or *Wilayah Sungai*). (Based on Government Regulation 37 of 2012, Law 23 of 2014, Law 37 of 2014, and Law 17 of 2019)

Table 16.1 Water resources regulations with river basin territory and watershed as conceptual foundations

Water resources regulation	Conceptual foundation
Law 17/2019 concerning Water Resources and regulations under this Law	River basin territory, i.e., with a predominantly *blue water* perspective
Law 37/2014 concerning Soil and Water Conservation and regulations under this Law	Watershed, i.e., with a predominantly *green water* perspective

The RBT concept is the major foundation of Law 17/2019 concerning Water Resources while the watershed idea is foundational for Law 37/2014 concerning Soil and Water Conservation (Table 16.1). Hence, the distinction between *blue water* and *green water* is in essence the basis of two different water governance approaches that are enshrined in either the one or the other Law. This distinction presents itself further in the regulations and policies derived from the two Laws. This is also obvious at the planning and implementation level: Law 17/2019 is the legal basis of action plans with a predominantly infrastructural approach, whereas Law 37/2014 of those with a largely vegetative and social-ecological approach.

In Indonesia there are 17,076 watersheds[12] and 128 RBTs[13]. Conform to Law 17/2019, the distribution of water resources authority between the central, provincial, and district/city governments should be based on the RBT concept. The Law instructs the government to make available guidelines to synchronising the various levels that can be used by stakeholders. The guidelines can be in the form of a Schemes for Water Resources Management document (*Pola Pengelolaan Sumber Daya Air*) providing guidance for a simultaneous factoring in of surface water and groundwater. The document can serve as a master plan for facilitating the conservation, utilisation and control of water's destructive characteristics (e.g., erosivity) while also taking account of the contextual factors affecting water resources.[14] The guidelines as envisioned by the Law should be prepared by a high-level team of relevant agencies and further elaborated by institutions that are responsible for the formulation of implementation plans.

That with the significant variability of the many factors affecting RBTs, the management of RBTs cannot be conducted in a generic way is obvious. This is more necessary in case an RBT consists of watersheds with complex interconnections. An RBT typology is urgently needed that captures and anticipates potential complexities. Another need is the availability of guidelines for regional/local planners and implementors for prioritising RBT activities and developing action plans using accurate data. Up to now, only national-level guidelines exist in the form of two regulations: River Basin Territory Water Resources Management Scheme (Pola PSDA-WS) and Integrated Watershed Management Plan (RPDAS-Terpadu).

16.2.3 Legal and Institutional Measures

The effectiveness of water resources governance in Indonesia is the result of external and/or internal factors. Internal factors are associated with the legal and institutional measures that are applied in water resources governance, which is the focus of the present section. External factors are, for instance, population growth affecting land use change or climate change shaping extreme climatological conditions, in turn affecting hydrological cycles (Maheshwari et al., 2016; Bappenas, 2015; Fulazzaky, 2014; Reddy et al., 2017).

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[12] Decree of Director General Watershed Control and Protected Forest No. SK.30/PDASHL/SET/REN 0/9/2020.

[13] According to Ministerial Regulation, Ministry of Public Works and Public Housing No. 04/PRT/M/2015 concerning Criteria and Determination of River Basin Territory, the 128 RBTs include five Cross-Country RBTs; 28 Nationally Strategic RBTs; 31 Cross-Provincial RBTs; 52 Cross-Regency/City RBTs; and 12 RBTs within a single district or city.

[14] These factors include: size of the area, population in nearby areas, hydrological and climatic conditions, socio-economic activities, water utilisation rates, number of water users and their demands, and institutional management systems.

Legal Measures Water resources governance in Indonesia applies various legal measures. We discuss two principal legal measures: (i) the provision of community rights; and (ii) financial support for the implementation of regulations. The first is exemplified by Law 41/1999 on Forestry and its predecessor Law 5/1967. Our review reveals that the latter provided insufficient space for community rights and placed the State in a dominant position. The superseded 1967 Forestry Law views the State indeed as the core power-holder in the planning, administration, exploitation and protection of state forest. The promulgation of Forestry Law No. 41/1999 has shaped more space for the involvement of local and indigenous communities in forest management. For instance, the Law includes a provision that gives indigenous people the rights to manage their customary forest (Pambudi, 2020) and creates thereby a legal entry point for the empowerment of local and customary communities and stakeholders in officially supported initiatives (Kusumanto, 2006, 2007) (Yuliani et al., 2023, in press).[15] At the same time, it legitimises the State to maintain its central role in efforts of sustainable forest management (Pambudi, 2020). Furthermore, with the Law, the importance of local knowledge is acknowledged and provides local and indigenous communities with incentives to contribute to sustainable development through forestry (Rakatama & Pandit, 2020).

Financial support is the other major legal measure to enable implementation of laws and regulations. It should be noted that water resources policies that have been implemented since independence have significantly consumed budgetary resources. This is especially the case for financing forest and land rehabilitation and dam construction, resulting in more than 219 water reservoirs and more than 36,500 dams. Nevertheless, a closer examination reveals that these initiatives have a suboptimal effect from a water resources conservation view. Despite an increase in forest cover area, they have not resulted in a significant reduction of annual sedimentation levels.

Institutional Measures ***in Indonesia*** We discuss the following measures along with the constraints that confront each of them: *coordination and communication*, *mandates*, *institutional budgets*, *time factor*, *law enforcement*, *planning and technical guidelines*, and *institutional duties and roles*. We assert that ineffectiveness of legal measures as previously discussed is essentially due to institutional constraints.

Discrepancies between expected and achieved outcomes—sometimes referred to as achievement gap—of water resources policies and programmes can largely be attributed to the limited efficacy of existing management systems of public institutions (Lubis et al., 2018). Identifying the root causes of these discrepancies is difficult because a large number of agencies play a role in water resources governance. In addition, the public agencies involved operates each at their specific government level—central, regional or local level—and a well-functioning communication across levels is often lacking. The fact that public agencies may be linked with an array of private and community organisations complicates this situation.

[15] Law No. 41 of 1999 (Annex 16.1).

1. Coordination and Communication

There is no doubt that for watershed-based water resources management to be effective, implementation should be across jurisdictional, sectoral, and institutional boundaries. An ecoregional approach would thereby be the ideal for which high-level coordination and communication are key. Literature shows that failures to address weak coordination in management are the most significant challenges confronting water resources governance (Pambudi et al., 2020). Proper implementation of action plans contained in the Integrated Watershed Management Plan and Water Resources Management Schemes can often not be carried out, especially at the local government level. This is largely due to weak communication between implementing agencies as well as the weak role of the Regional Development Planning Agency (Bappeda) in leading development planning processes (Lubis et al., 2018).

2. Institutional Mandates

Quite a number of laws are weak in giving directions for translating institutional mandates to implementation plans at operational level. They include Law 17/2019 concerning Water Resources, Law 41/1999 concerning Forestry, Law 37/2014 concerning Soil and Water Conservation, Law 26/2007 concerning Spatial Planning, Law 18/2003 concerning Prevention and Eradication of Forest Damage, Law 32/2009 concerning Environmental Protection and Management, Law 23/2014 concerning Regional Government, Government Regulation 37/2012 concerning Watershed Management, Government Regulation 26/2008 concerning National Spatial Planning, Forestry Ministerial Regulation P.39/Menhut-II/2009 concerning Guidelines for Formulating Integrated Watershed Management Plans, and Forestry Ministerial Regulation P. 61/Menhut-II/2013 concerning Watershed Management Coordination Forums.

Among these regulations, three Laws show considerable mandate failures, namely Law 41/1999, Law 26/2007, and Law 37/2014 (Table 16.2). The first two Laws mandate that a minimum of 30% of forest cover within watershed landscapes

Table 16.2 Water resources laws with poorly implemented mandates

Regulation	Mandate
Law 41/1999 concerning Forestry	Maintain a minimum of 30% forest cover proportionally distributed over watershed landscapes.
Law 26/2007 concerning Spatial Planning	Maintain a minimum of 30% forest cover in watershed landscapes.
Law 37/2014 concerning Soil and Water Conservation	Land owners, land rights holders, and permit holders conduct activities conform to principles of good soil and water conservation and provide payments for environmental services to organisers of soil and water conservation; Government agencies provide assistance, compensation, and incentives to those involved in soil and water conservation (Article 36).

should be maintained. Law 37/2014 encounters challenges at the operational level whereby land owners, land rights holders, and permit holders fail to conduct activities conform to principles of good soil and water conservation. Another mandate that has been poorly acted upon also relates to this Law. It mandates the provision of payments for environmental services to the organisers of conservation initiatives. Article 36 of Law 37/2014 also mandates government agencies to provide assistance, compensation, and incentives to all those that are involved in soil and water conservation. Both mandates have been poorly implemented and the conversion of protected and primary forest has continued unabated, affecting hydrological cycles and watershed functioning.

3. Institutional Budgets

The application of legal measures is greatly challenged by the budgetary setting of the associated water resources sector, institution, or government level. Among the main reasons why some legal measures have not been effective is a lack of budgetary support.

4. Timely Availability of Implementation Regulations

The efficacy of legal measures also depends on the timely availability of implementation regulations. A serious time-delay, for instance, concerns Law 37/2014 concerning Soil and Water Conservation. Its implementation regulations are still being drafted at the time of writing—i.e., seven years after enactment of the Law. Such a serious time delay clearly hinders a timely implementation of the Law, both in legal terms and technically.

5. Law Enforcement

A weak law enforcement by public institutions is another factor that influences the efficacy of legal measures. Law 37/2014 concerning Soil and Water Conservation mandates the sanctioning of smallholders, individuals and businesses that violate soil and water conservation regulations by way of fines or imprisonment. In practice this mandate has hardly been enforced. Under the same Law, a weak enforcement is connected to the designation of open green space. While the Law requires that this should be at least 30% of the total area, a number of provinces, districts and cities have not met with this requirement. Yet, no sanctions have been put on them. The Law provides a legal basis for sanctioning individuals, institutions, and corporates that do not use land in accordance with the Law's spatial plans. Also here law enforcement has been lacking. Moreover, while Government Regulation 26/2008 concerning National Spatial Plan provides spatial planning permits, these are hardly followed or have limitedly taken account of the regulation's spatial plan (Lubis et al., 2018). Law 18/2013 stipulates that individuals, institutions, and businesses who conduct plantation activities without permits or carry out illegal activities may be imprisoned or fined. In practice, such activities have hardly been controlled and the Law has been seriously violated.

6. Planning and Technical Guidelines

Law 32/2009 on Environmental Protection and Management states that the central and regional/local governments are obliged to prepare and implement a Strategic Environmental Assessment (SEA). The assessment should serve as a reference for regional development policies and plans, including for the formulation and preparation of development and regional spatial plans (RPJP, RPJM, RTRW and other planning documents). SEAs have not been used effectively. In addition, Article 17 of Law 32/2009 includes a clause stipulating that if SEA assesses that proposed activities exceed the environmental carrying capacity of a given area, they should be adjusted as directed by the SEA. In reality, SEA has been weak as an instrument for managing environmental carrying capacity and addressing impacts on the sustainability of watersheds.

7. Institutional Duties and Roles[16]

Institutional duties and roles in the management of water resources have often led to so-called "cannibalism" of programmes or activities. For example, a technical agency plants trees by the banks of a river in order to conserve water resources. However, not long afterwards, another agency starts dredging the river and disposes sedimentation by the same riverbanks where the trees have been planted. This points to two particular issues: a lack of coordination and a tendency of these agencies to focus narrowly on their institutional duties and roles.

16.3 Regulations, Policies, Planning, and Challenges: A Synthesis

16.3.1 Regulations

This section synthesises water resources regulations that are currently applied in Indonesia and discusses their challenges. Our core focus is on regulations that apply under incumbent President Jokowi. The synthesis should be put against a background with the history, conceptual foundations, and main issues of water resources governance as discussed in the previous sections. Table 16.3 shares the three major water resources regulations and their relevance for governance.

Government Regulation 37/2012 concerning Watershed Management mandates the formulation of Watershed Management Plans (RPDAS) to:

- The central government/minister at the national and interprovincial levels.
- Provincial governors and their agencies at provincial, inter-district, and inter-city levels.
- District heads and mayors at district and city levels.

[16] Usually referred to in Indonesian as (institutional) *tupoksi*, the acronym of *tugas pokok* dan *fungsi*.

Table 16.3 Water resources regulations and relevance for governance

Regulation	Authorising state document	Relevance for governance
Government Regulation 37/2012 concerning Watershed Management	Law 41/1999 concerning Forestry	The Regulation mandates government to maintain a minimum of 30% forest area or 30% forest cover of watershed landscapes; It mandates government at relevant levels to formulate Watershed Management Plans (RPDAS); and conduct, monitor and evaluate watershed management.
Law 17/2019 concerning Water Resources[a]	1945 State Constitution of the Republic of Indonesia	The Law regulates the conservation and utilisation of water resources and the control of water's destructive characteristics (e.g., erosivity). It instructs water resources and community participation be incorporated in planning. It instructs a water resources information system database be in place.
Government Regulation 26/2008 concerning National Spatial Plan	Law 26/2007 concerning Spatial Planning	The Regulation mandates government that at least 30% of an island's area be designated as a protected area. It requires land use zones on a given island to be reflected in the distribution of the island's ecosystems.

[a] At time of writing, no government regulation has as yet replaced Government Regulation 42/2008 concerning Water Resources, which was abolished upon enactment of Law 17/2019

Despite the above mandate, the formulation of RPDAS is often delegated to the Watershed Management and Protection Forest Agency (*Balai Pengelolaan Daerah Aliran Sungai dan Hutan Lindung*, BPDAS-HL). This is a technical unit of MoEF at central level or an agency under the ministry at lower government levels. Regional/local heads of government are only expected to officially issue the plans. Budgets for formulating the RPDAS are allocated to BPDAS-HL with a result that regional/local governments show little ownership. Remarkably, the Regulation does not prescribe to put in place institutional measures for allocating budgets to regional/local governments to formulate the RPDAS.

Furthermore, the Regulation mandates the conduct of watershed management to relevant government levels. It includes a provision for the central government to intervene if the regional/local government were unable to fulfil its mandate. However, this provision is rarely used and BPDAS-HL has remained the core responsible agency. Similarly, while section 50 of the Regulation mandates monitoring and evaluation to the relevant government levels, activities are often implemented by the BPDAS-HL.

Government Regulation 37/2012 also states that RPDAS should serve as technical guidance for sectoral and regional development in each province, district and city (Pambudi, 2019). In reality, incorporating RPDAS in regional/local plans (RTRW/RPJPD) is extremely difficult because many action plans in the RPDAS are either not operational or not implementable by regional/local governments.

Another challenge that confronts an effective implementation of the Regulation is the promulgation of Law 23/2014 on Regional Government. This Law states that the mandate for watershed management at district or city level rests at the provincial government (Pambudi, 2019). There is thus a mismatch between the two regulations.

Law 17/2019 concerning Water Resources regulates the conservation and utilisation of water resources and control of water's destructive characteristics (e.g., erosivity). It also instructs that water resources and community participation be incorporated in planning and a water resources information system database be put in place. The Law, nonetheless, does not connect its provisions with the vegetative, agronomy and social (participatory) aspects of water resources governance. This link with the *green water* perspective is a main flaw of this Law. As legal basis for these aspects it refers instead to Law 37/2014 concerning Soil and Water Conservation.

Government Regulation 26/2008 concerning the National Spatial Plan requires that at least 30% of the land area of a given island should be designated as a protected area. It is also required that the designation of land use zones should reflect the distribution of the island's ecosystems. Discrepancies between stated aims of the Regulation and actual outcomes are due to failures to meet these requirements.

The Regulation provides guidance on measures for ensuring ecosystem resilience by addressing internal and external changes and shocks that can be detrimental to ecosystems. It has been difficult in practice to effectively control the protective function of land areas intended for that purpose (Pambudi, 2019). The Regulation also requires measures to restore and improve the functioning of protective zones where land degradation occurs due to adverse plantation and agricultural activities. Policies and action plans should focus on the development and maintenance of balanced ecosystems at regional scales. In reality, in many protective areas within and outside state forests inadequate measures are applied to assure that they are utilised for their intended purposes. Nor are activities conducted to effectively restore and improve their protective functions.

Policies-outcomes discrepancies of the Regulation are largely due to a lack of oversight and weak law enforcement of plantation activities, necessary to ensure that environmental carrying capacities not be exceeded. Many plantations largely negate this aspect. More broadly, the development of plantations is flawed because hardly any control mechanism is put in place for addressing or anticipating disasters in watersheds.

The Regulation includes provisions that aim at resilient ecosystems, significant biodiversity levels, and well-functioning protective zones and nature reserves.

Protected zones are often situated in upstream areas of watersheds. Despite government efforts to communicate these objectives, substantive land areas are converted for which no permits are granted. Another challenge is the weak formulation of strategies for maintaining improved ecosystem functioning.

16.3.2 Policies

Under President Susilo Bambang Yudhyono (2004–2014) respectively Jokowi (2014-present) water resources have been governed through the Ministry of National Development Planning (Bappenas). Three consecutive medium-term national development plans (RPJMN) underline the role of water resources in development. Under RPJMN 2010–2014, Presidential Regulation 5/2010 prioritised the conservation and management of water resources and mandated implementation to four ministries, i.e., MoPWH, MoEF, MoA, and Ministry of Energy and Mineral Resources (MoEMR).

MoPWH was mandated to enhance the development and rehabilitation of water reservoirs in aiming at increasing water supply capacities and attaining the sustainability of water resources.[17] Rehabilitation of reservoirs and dams included those for flood risk reduction.[18] The plan also sets targets for improving the quality of infrastructure services of raw water and the development of management systems for irrigation management, swamps, and water networks under the responsibility of MoPWH.

RPJMN 2010–2014 underscored the role of MoEF in facilitating forest rehabilitation and other relevant land use to support water resources conservation through a vegetative approach. It also covered among other matters the rehabilitation of non-forest areas, land reclamation in priority watershed areas, and establishment of seed banks for land rehabilitation initiatives, together with measures to improve watershed management through the formulation of integrated RPDAS in 108 priority watershed areas.

In the same period, the MoA focused on the rehabilitation of irrigation infrastructures, besides some engagement in watershed conservation. It also enhanced water supply for agricultural irrigation through development of small-scale water sources,[19] water resources conservation through the development of dams, check dams, and absorption wells, and measures to improve the resilience of watersheds to climate change, covering 160,000 hectares.

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[17] Which concerns 12 reservoirs and 158 dams.

[18] Which comes to 29 reservoirs and 298 dams, including for flood risk reduction of Bengawan Solo watershed (Central Java Province) and of Banjir Kanal Timur (Greater Jakarta).

[19] Such as village irrigation systems, wells, and water pumps.

In this period, MoEMR was mandated to implement policies related to the conservation of water resources, including providing guidance to private sector operators involved in the sale and distribution of groundwater through an inventory of groundwater taxes; the establishment of groundwater utilisation zones; and the facilitation of research and geological and groundwater mapping in order to identify the number of clean water bores that serve the needs of communities in remote and disadvantaged areas, particularly those with limited access to water supplies. MoEMR also provided recommendations on protected geological zones and water resources, based on hydrological maps with 1:250,000 scale; submerged groundwater maps with 1:100,000 scale; water conservation maps; and data related to groundwater utilisation based on water taxes in 33 provinces. It also conducted an investment inventory related to the industrial production of drinking products derived from groundwater.

During Jokowi's administration, Presidential Regulation 2/2015 concerning National Medium-Term Development Plan (RPJMN) 2015–2019 was promulgated with three policy priorities, namely aiming at water security, food security and energy.

MoPWH was mandated under this RPJMN to develop and rehabilitate water reservoirs,[20] as well as to improve water absorption and natural carrying capacity through the rehabilitation of rivers, lakes and swamps; protect natural water sources; improve water quality; expand the irrigation network; and develop and rehabilitate groundwater infrastructure.

Under RPJMN 2015–2019, MoEF was given mandate to focus on the rehabilitation of forests and other land uses as a means to achieve water conservation objectives. The Ministry adopted thereby small to medium scales vegetative and/or civil technical approaches. Initiatives during this period included the restoration of the health of 15 prioritised watershed areas; implemented 108 RPDAS formulated for regional/local levels (RTRW); intensified the rehabilitation and conservation of land and water resources as a means to reduce the area of critical land and thereby improve the health of watersheds and water sources.

Under RPJMN 2015–2019, MoA was tasked to rehabilitate agricultural infrastructures and irrigation facilities. The Ministry conducted initiatives and activities to improve the supply of irrigation water and to support agricultural production through the development of irrigation facilities, reservoirs, dams, and small-scale alternative water sources, and to strengthen farmer organisations, improve irrigation water system management, and improve three million hectares of degraded irrigated land.

In RPJMN 2015–2019 period, the MoEMR applied a number of policies on water resources utilisation and conservation, including to enhance the utilisation of hydrological energy production;[21] establish a management system for

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[20] Specific targets included the construction of 45 reservoirs and 216 dams, and the rehabilitation of 11 reservoirs and 143 dams.

[21] By advancing the capacity of hydrological generation plants from 3.94 to 6.88 gigawatts.

hydrological energy; improve clean water supply through groundwater bores; and improve the quality of data, information, and recommendations for groundwater management.

Water resources policies under National Medium-Term Development Plan 2020–2024 are geared to balance water conservation and utilisation, upstream and downstream, utilisation of surface water and ground water; water demand and supply, and short-term and long-term interests. Control of water's destructive character, particularly related to flooding, is carried out through water conservation and watershed management measures in accordance with spatial plans. Furthermore, policies for addressing the adverse impacts of water are focused on climate change mitigation and adaptation including for dealing with floods, droughts, and sea level rise.

16.3.3 Planning

In many aspects of life, water resources are indispensable as a source of living for humans and non-humans alike. The 1945 State Constitution of the Republic of Indonesia entitles every citizen to have access to clean, safe and sufficient water to lead a healthy, prosperous, and productive life. Nonetheless, the planning for a fair and sustainable utilisation of water resources is challenged by conflicts of interest.

A main challenge is the need to synchronise the many regulations on water resources in meeting the country's water security targets by 2045. It is expected that next to public agencies and parastatal corporates the private sector takes responsibility for water supply facilities and operations to ensure that water demands of consumers and the businesses can be met in sustainable ways.

A financial shortage exists at present to cover the investments that were made in meeting demands in 2015–2019, amounting to 274.8 trillion Indonesian Rupiahs. In order to resolve this investment gap, alternative financial sources, including foreign and private sources, are needed. In aiming at sustainable financing and ensuring that operations proceed legally, it is crucial that the necessary regulations and control mechanisms are put in place.

The governance of water resources should also be focused on shaping collaboration and synergy between regions, sectors, and generations. A main challenge is the coordination of water resources management, the use of land and other natural resources for attaining a balanced social, environmental and economic functioning of water resources.

16.4 A Way Forward

Those engaged in the environment, forestry and/or water management and infrastructure in Indonesia may know all too well that the country's water resources governance has a dual character to some extent. This manifests itself in a regulatory framework with an environment and forestry perspective besides a water infrastructural angle. Yet both have one and the same goal: water security for the people. Interestingly, this dual character seems to have been adopted by the State—represented by the government—as a way to address "silo thinking". This dual strategy is perceived as an effective means for engaging relevant stakeholders whilst simultaneously governing water resources processes in attaining a shared goal. The strategy could have worked, if institutional coordination were strong. Our investigation reveals that this has been immensely challenged by ways in which public institutions are organised and operate.

Despite prevalent institutional challenges, a window of opportunity becomes obvious: sectoral "silo thinking" goes hand in hand with a tendency of institutions to integrate programmes or approaches, such as in *integrated watershed management* or *integrated water resources management*. This indicates a need for collaboration across institutional and sectoral boundaries and a seed is planted for collaboration that can be promoted and expanded in the future. Our review makes obvious that water governance is inherently a transboundary endeavour and necessitates an ecoregional approach. However, for efforts to be successful, they will depend on political will, institutional support and societal acceptance. It will also need a society-wide awareness that the aim of water resources governance is to meet water security in an environmentally sustainable way, rather than meeting institutional duties and roles.

Changing existing structures and processes of water resources governance cannot happen overnight. It necessitates an enhanced knowledge of consumers and society at large about adaptations in water services and institutions. Importantly, it will also need government's acknowledgement to remove entrenched detrimental "ego-sectoral" and "ego-regional" attitudes.

Learning from Indonesia's national medium-term development plan of 2015–2019 and 2020–2024, which have delivered poor development outcomes, we recommend the below three guiding points for future action:

1. Future national five-year development plans should use performance and target indicators that are thoroughly and comprehensively designed for application by public, private, and community institutions.
2. Development plans should be based on a thorough evaluation of the previous plan and build on achieved outcomes and adapt to changing needs, environmentally, socially, and economically. Continuation of previous plans will nonetheless be challenged by political aspirations of incumbent or candidate political leaders of a given period. Only an open public discourse can help in resolving conflicts.

3. Water governance targets should not only be set for a given sector, ministry or institution, but be part of a comprehensive governance system that facilitates and synchronise sectors, ministries, institutions, communities and the private sector at the necessary levels and scales.

In order to effectively synchronise central and regional/local water regulations, we recommend that the President as *political leader* and as *institution* cooperate with Parliament to lead processes. The use of a "carrot and stick" approach[22] is encouraged that aim at unambiguous national objectives of water resources planning, conservation, and management. We urge President and Parliament to issue regulations that enable synchronisation processes from the central through regional/local public administrative levels.

We also recommend a thoroughly designed society-wide participation including disadvantaged groups such as women, the elderly, the young, and the disabled. It is of utmost importance to mainstream a *gender-responsive approach* in water resources governance.

Furthermore, our recommendation concerns the need for continuity in water resources monitoring and evaluation. Public institutions that are mandated with the duties and roles for monitoring and evaluation should effectively coordinate and facilitate all relevant stakeholders in the process. Institutional *checks and balances* should be put in place in case water regulations of a given sector compete with, contradict, or side-line water regulations of other sectors or institutions.

Water resources governance has not occurred comprehensively at regulation, planning, and implementation levels. We recommend the development of water resources governance with an *ecoregional perspective*, whereby the boundaries of an ecoregion are determined by its hydrological cycle. An ecoregional governance system is essentially *polycentric* and addresses power asymmetries between different jurisdictions at upstream, middle and downstream levels of watersheds. New institutions can be established or existing institutions be enhanced to deliver strong basin-wide coordination and ecoregional functioning. It also is crucial to effectively engage regional/local governments because most water-related interventions can only be successful if conducted at these levels.

Time is long overdue to view water resources governance as a core pillar of Indonesia's water security, rather than as a means to promote and protect the own sectoral, institutional, or political interests. At the end of the day the latter can be detrimental to the country, its people, and the environment.

[22] More often referred to as a "rewards and punishment" approach.

Annexes

Annex 16.1: Laws and Regulations Reviewed (in Chronological Order of Enactment)

Law 11 of 1974 concerning Irrigation (*Undang-undang Nomor 11 Tahun 1974 tentang Pengairan*).

Law 41 of 1999 concerning Forestry (*Undang-undang Nomor 41 Tahun 1999 tentang Kehutanan*).

Law 25 of 2007 concerning Spatial Planning (*Undang-undang Nomor 26 Tahun 2007 tentang Penataan Ruang*).

Government Regulation 26 of 2008 concerning National Spatial Plan (*Peraturan Pemerintah Nomor 26 Tahun 2008 tentang Rancana Tata Ruang Wilayah Nasional*).

Law 32 of 2009 concerning Protection and Management of the Environment (*Undang-undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup*).

Government Regulation 37 of 2012 concerning Watershed Management (*Peraturan Pemerintah Nomor 37 Tahun 2012 tentang Pengelolaan Daerah Aliran Sungai*).

Law 18 of 2013 concerning Prevention and Eradication of Forest Destruction (*Undang-undang Nomor 18 Tahun 2013 tentang Pencegahan dan Pemberantasan Kerusakan Hutan*).

Ministerial Regulation Ministry of Forestry P.61/Menhut-II/2013 concerning Watershed Management Coordination Forum (*Permenhut P.61/Menhut-II/2013 tentang Forum Koordinasi Pengelolaan Daerah Aliran Sungai*).

Presidential Regulation 2 of 2015 concerning National Medium-Term Development Planning 2015–2019 (*Peraturan Presiden Nomor 2 Tahun 2020 tentang Rencana Pembangunan Jangka Menengah Nasional Tahun 2015–2019*).

Law 23 of 2014 concerning Regional Government (*Undang-undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah*).

Law 37 of 2014 concerning Soil and Water Conservation (*Undang-undang Nomor 37 Tahun 2014 tentang Konservasi Tanah dan Air*).

Ministerial Regulation of the Ministry of Public Works and Public Housing 04/PRT/M/2015 concerning Criteria and Determination of River Basin Territories (*Peraturan Menteri Pekerjaan Umum dan Perumahan Umum Nomor 04/PRT/M/2015 Tentang Kriteria dan Penetapan Wilayah Sungai*).

Law 17 of 2019 concerning Water Resources (*Undang-undang Nomor 17 Tahun 2019 tentang Sumber Daya Air*).

Presidential Regulation 18 of 2020 concerning National Medium-Term Development Planning 2020–2024 (*Peraturan Presiden Nomor 18 Tahun 2020 tentang Rencana Pembangunan Jangka Menengah Nasional Tahun 2020–2024*).

Decree of Director General of Watershed Control and Protected Forest SK.30/PDASHL/SET/REN 0/9/2020 concerning Strategic Plan of Directorate General of Watershed Control and Protected Forest 2020–2024 (*Keputusan Direktur Jenderal Pengendalian dan Perlindungan Hutan Nomor SK.30/PDASHL/SET/REN tentang Rencana Strategis Direktorat Jenderal Pengendalian Daerah Aliran Sungai Dan Hutan Lindung*).

Annex 16.2: Abbreviations and Acronyms

Abbreviation/ acronym	Indonesian	English equivalent
Bappeda	Badan Perencanaan Pembangunan Daerah	Regional Development Planning Agency
Bappenas	Badan Perencanaan Pembangunan Nasional	National Development Planning Agency
BPDAS-HL	Balai Pengelolaan Daerah Aliran Sungai dan Hutan Lindung	Watershed Management and Protection Forest Agency
DAK	Dana Alokasi Khusus	Special Allocation Funds
GERHAN	Gerakan Nasional Rehabilitasi Hutan dan Lahan	National Movement for Forest and Land Rehabilitation Programme
KLHS	Kajian Lingkungan Hidup Strategis	Strategic Environmental Assessment
MoA	Kementerian Pertanian	Ministry of Agriculture
MoEF	Kementerian Lingkungan Hidup dan Kehutanan	Ministry of Environment and Forestry
MoEMR	Kementerian Energi dan Sumber Daya Mineral	Ministry of Energy and Mineral Resources
MoPWH	Kementerian Pekerjaan Umum dan Perumahan Rakyat	Ministry of Public Works and Public Housing
Pola PSDA	Pola Pengelolaan Sumber Daya Air	Scheme for Water Resources Management
Pola PSDA-WS	Pola Pengelolaan Sumber Daya Air Wilayah Sungai	Scheme for Water Resources Management of River Basin Territory
RBT	Wilayah Sungai	River Basin Territory
REPELITA	Rencana Pembangunan Lima Tahun	Five-Year Development Plan
RPDAS	Rencana Pengelolaan Daerah Aliran Sungai	Watershed Management Plan
RPJMD	Rencana Pembangunan Jangka Menengah Daerah	Regional Medium-Term Development Plan
RPJMN	Rencana Pembangunan Jangka Menengah Nasional	National Medium-Term Development Plan
RPJP	Rencana Pembangunan Jangka Panjang	Long-Term Development Plan
RPJPD	Rencana Pembangunan Jangka Panjang Dearah	Regional Long-Term Development Plan
RTRW	Rencana Tata Ruang Wilayah	Regional Spatial Plan

References

Bappenas. (2015). *Kajian Pengaruh Kebijakan Konservasi Sumber Daya Air di dalam DAS Terhadap Sektor Kehutanan dan Sektor lainnya*. Ministry of National Development Planning/National Development Planning Agency of the Republic of Indonesia (Bappenas).

Bappenas. (2019). *Indonesia 2045: Maju, Berdaulat, Adil dan Makmur*. Jakarta: Ministry of National Development Planning/National Development Planning Agency of the Republic of Indonesia (Bappenas).

Bellfield, B., Leggett, M., Trivedi, M., Pareira, J., & Gangga, A. (2016). *How can Indonesia achieve water, energy and food security?* WCS and Global Canopy Programme.

Chen, K., Yang, S., Zhao, C., Li, Z., Luo, Y., Wang, Z., & Yu, X. (2016). Conversion of blue water into green water for improving utilization ratio of water resources in degraded karst areas. *Water, 8*(12), 569. https://doi.org/10.3390/w8120569

Fulazzaky, M. (2014). Challenges of integrated water resources management in Indonesia. *Water, 6*(7), 2000–2020. https://doi.org/10.3390/w6072000 3, 5, 6, 14.

Kusumanto, T. (2006). *Social learning, policymaking and customary forest: Lessons from Jambi (central Sumatra)*. Research Report. Unpublished. CIFOR.

Kusumanto, T. (2007). Shaping opportunities for improving forest quality and community livelihoods in Central Sumatra and East Kalimantan, Indonesia. In R. Fisher, R. Prabhu, & C. McDougall (Eds.), *Adaptive collaborative management of community forests in Asia: Experiences from Nepal, Indonesia and the Philippines* (pp. 93–133). CIFOR.

Lubis, R. F., Delinom, R., Martosuparno, S., & Bakti, H. (2018). Water-food nexus in citarum watershed, Indonesia. *IOP Conference Series: Earth and Environmental Science, 118*, 012023. https://doi.org/10.1088/1755-1315/118/1/012023

Maheshwari, B., Singh, V.P., & Thoradeniya, B. (2016). *Balanced urban development: Options and strategies for liveable cities.* Water Science and Technology Library. ISBN 978-3-319-28110-0 ISBN 978-3-319-28112-4 (eBook). https://doi.org/10.1007/978-3-319-28112-4

Nawir, A. A., Murniati & Rumboko, L. (2008). *Rehabilitasi Hutan di Indonesia: Akan Kemanakah Arahnya Setelah Lebih dari 3 Dasawarsa?* CIFOR.

Pambudi, A. S. (2019). Watershed management in Indonesia: A regulation, institution, and policy review. *The Indonesian Journal of Development Planning, 3*(2), 185–202. https://doi.org/10.36574/jpp.v3i2.74

Pambudi, A. S. (2020). The development of social forestry in Indonesia: Policy implementation review 2007–2019. *The Journal of Indonesia Sustainable Development Planning (JISDeP), 1*(1), 57–66. https://doi.org/10.46456/jisdep.v1i1.11

Pambudi, A. S., Moersidik, S. S., & Karuniasa, M. (2020). Keterkaitan Perilaku Masyarakat dengan Penggunaan Lahan dan Erosivitas Limpasan Permukaan di Sub DAS Lesti, Kab. Malang (Relationship between community behavior with land use and surface runoff erosivity in Lesti Subwatershed, Malang District). *Jurnal Penelitian Pengelolaan Daerah Aliran Sungai (Journal of Watershed Management Research), 4*(2), 155–172. https://doi.org/10.20886/jppdas.2020.4.2.155-172

Rakatama, A., & Pandit, R. (2020). Reviewing social forestry schemes in Indonesia: Opportunities and challenges. *Forest Policy and Economics, 111*, 102052. https://doi.org/10.1016/j.forpol.2019.102052

Razali, A., Syed Ismail, S. N., Awang, S., Praveena, S. M., & Zainal Abidin, E. (2018). Land use change in highland area and its impact on river water quality: a review of case studies in Malaysia. *Ecological Processes, 7*(1). https://doi.org/10.1186/s13717-018-0126-8

Reddy, V. R., Saharawat, Y. S., & George, B. (2017). Watershed management in South Asia: A synoptic review. *Journal of Hydrology, 551*, 4–13. https://doi.org/10.1016/j.jhydrol.2017.05.043

Reh, W., Steenbergen, C., & Aten, D. (2007). *Sea of Land, The polder as an experimental atlas of Dutch landscape architecture* (344 pp.) Architectura & Natura.

Santoso. (2005). *Arah Kebijakan dan Implementasi Rehabilitasi Hutan dan Lahan.* Presentation "Workshop Review of Rehabilitation Initiative: Lessons from the Past". CIFOR.

Sutardi. (2002). *Pengelolaan Sumberdaya Air Yang Efektif*. Lokakarya Strategi Pengelolaan dan Pengembangan Infrastruktur Wilayah Jawa Barat. Jawa Barat: Regional Development Planning Agency West Java Province. Not published.

Yuliani, E. L., Moeliono, M., Kusumanto, T., Marzoni, Permatasari, E., Adnan, H., Indriatmoko, Y., & Colfer, C. J. P. (2023, in press). Revisiting Baru Pelepat: Life after ACM (Indonesia). In: Colfer, C. J. P., & Prabhu, R. *Responding to Environmental Issues through Adaptive Collaborative Management: From Forest Communities to Global Actors*. Earthscan (Routledge). https://doi.org/10.4324/9781003325932-3.

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Chapter 17
Coordination Challenges Facing Effective Flood Governance in the Ciliwung River Basin

Georgina Clegg, Richard Haigh, Dilanthi Amaratunga, and Harkunti Pertiwi Rahayu

Abstract The Ciliwung River in Java, Indonesia, is known to cause frequent flooding in the downstream capital city of Jakarta. From source to mouth the river flows through several administrative units. Indonesia's decentralised governance structure means that each unit has the authority to develop its own plans and to address its own objectives. Not only that, but flood management spans many sectors, and these sectors need to work together throughout the decentralised governance system. This can pose a significant challenge to achieving integrated river management to mitigate flooding, where plans need to be carefully coordinated and high levels of collaboration are required. This chapter examines the current governance arrangements in the Ciliwung River Basin, to understand what challenges may be preventing successful coordination of flood management. The findings of the study are based on a systematic review of the literature conducted within the frame of the NERC and RISTEK-BRIN funded project: *Mitigating hydrometeorological hazard impacts through improved transboundary river management in the Ciliwung River Basin.* The findings suggest several issues that restrict the effectiveness of coordination for flood mitigation in the Ciliwung Basin. Imprecisely defined roles and responsibilities, issues including lack of capacity at the local level, insufficient coordination between local administrations, and limitations to the function of coordination platforms are some of the challenges identified. The findings highlight that coordination challenges do not only exist at basin scale, but that coordination issues beyond the basin can also have an impact. Overall, the chapter presents insights into the coordination challenges facing flood governance in urban transboundary basins. It also provides insights for practitioners on what aspects of river governance may need to

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be improved to support flood risk reduction, as well as potential topics for future research.

Keywords Ciliwung river · Coordination · Flood · Indonesia · River governance

17.1 Introduction

Transboundary river basins, those that cross political borders between countries or administrative jurisdictions, present a particularly complex governance challenge. Managing environmental problems within transboundary basins requires actors on either side of the border (or across multiple borders) to work together. This is due to the interconnectedness of a river basin system, and the fact that actions in one part of the basin are likely to have consequences elsewhere. It is therefore necessary to develop a governance arrangement that allows the relevant actors to coordinate (Bakker, 2009).

As Evans (2012) states in their book on environmental governance, "Governance is about asking what sort of world we want to inhabit, and how we can coordinate getting there" (p. 14). This chapter focuses on coordination as a key governance challenge that impacts society's ability to manage environmental concerns. To do this, the case of the Ciliwung River Basin, Java, Indonesia is examined. The Ciliwung is a transboundary river basin that crosses into Indonesia's capital city of Jakarta, and is known to cause acute flooding in the city. A lack of coordination between stakeholders has been noted to be a key issue facing progress towards flood resilience in Jakarta (Dwirahmadi et al., 2019).

Coordination is a term used alongside words such as cooperation and collaboration in the transboundary governance and river governance literature to denote some form of *working together*. For example, the dictionary definition of coordination is "the act of making all the people involved in a plan or activity work together in an organised way" (Cambridge Dictionary, 2022). Some researchers have distinguished different ways of working together, for example, Watson (2004) distinguishes between coordination and collaboration. They describe coordination as more of a 'rule-based' arrangement where government actors align their separate approaches to management. Collaboration on the other hand is seen as a more developed form of governance where actors work more closely together, pooling their expertise and resources to tackle a common problem. It is also often associated with the inclusion of non-government actors (Emerson et al., 2011; Margerum & Robinson, 2015). It has been suggested that collaboration may be better for tackling the complexity of river basin problems, and overcoming state capacity issues (Watson, 2004). Nevertheless, coordination is still required, and it remains a key challenge in the Ciliwung Basin. This chapter focuses on coordination, particularly the coordination of government actors, but also looks at the coordination mechanisms in place which include a wider array of stakeholders, with acknowledgement that this may only be one part of 'working together'.

This chapter presents the potential challenges facing the coordination of government actors in the Ciliwung River Basin, based on a literature review, and considers whether more developed collaboration may be possible within the basin. The chapter first sets out the context for the case of the Ciliwung River. The reasons why coordination is needed in transboundary basins are then presented. The methodology of the review is then given, followed by the findings on the challenges facing coordination in the Ciliwung. Lastly, the conclusions are given with suggested recommendations for improving coordination in the basin, and implications for environmental governance more widely.

17.1.1 The Ciliwung River Basin

The Ciliwung River Basin is a transboundary basin in Indonesia that crosses two provincial and five municipal borders. From the river's source in West Java, near Tugu Puncak, the river passes through the cities of Bogor and Depok before arriving into the downstream capital city of Jakarta. A primary environmental concern within the basin is the frequent and severe flooding in the capital city (Kefi et al., 2020). Jakarta has experienced frequent flooding throughout the city's history, but recent floods, combined with the threat of climate change, have raised concerns that the problem is becoming worse, and will only continue to worsen in the future. For example, severe floods have been experienced in 2007, 2013, 2014, 2015 and 2020. The recent floods in January 2020 were one of the most hazardous recorded, with 67 fatalities and the displacement of 28,000 people to emergency shelters (reports as of tenth January 2020) (ACAPS, 2020). The river itself has undergone a significant amount of structural management, with sections of flood barriers and several flood gates. However, such measures do not protect all areas and have limited sustainability. There is an urgent need to address the flood problem in the Ciliwung Basin in a more integrated manner (Asdak et al., 2018).

17.1.2 Why Is Coordination Important?

There are several reasons why coordination is a particularly salient issue for flood management in transboundary basins. Firstly, flooding is rarely caused by a single driver, but is often a result of a complex web of causes. This is no more true than in the heavily urbanised, and naturally flood prone, Ciliwung River Basin. Here, there are several physical aspects that contribute to increased flood risk.

Firstly, heavy precipitation events are common. The region has a tropical monsoon climate that brings heavy precipitation during the peak wet season (December–February) (Siswanto et al., 2015), but local convection also brings intense downpours throughout the year (Tjasyono et al., 2008).

In addition, land subsidence, owing to both natural and human processes, has resulted in large parts of Northern Jakarta lying below sea level. Rates of subsidence are estimated to be between one and 15 centimetres per year (dependent on location, and may be higher in places) (Abidin et al., 2011), with recent calculations suggesting accumulated subsidence to be approximately five metres (Cao et al., 2021) The subsidence impairs the effectiveness of drainage systems, and prevents water from the rivers discharging effectively into the sea, resulting in increased flood risk (Abidin et al., 2011). Estimates suggest that continuing subsidence will increase the flood inundation volume in the city 9.1% by 2050 compared to 2013 if unaddressed (Moe et al., 2017).

There are also other human drivers compounding the problem. In the downstream area of Jakarta there has been rapid economic and population growth that has resulted in rapid urbanisation of the city. Over time the city has agglomerated with neighbouring urban areas in the midstream. These high levels of urbanisation have increased the quantity of impermeable surface and led to reduced infiltration and run-off (Remondi et al., 2016). Furthermore, in the upstream part of the catchment, there has been significant deforestation (Asdak et al., 2018). Studies have indicated intensification of basin response and increases in peak flow and sediment load in the Ciliwung as a consequence of land clearance (Remondi et al., 2016). Continued land use change is projected to increase flood inundation volume significantly if overlooked (Moe et al., 2017). Furthermore, urban development and the increased cost of living in Jakarta have pushed the urban poor into informal settlements on the banks of rivers. These settlements are highly exposed and vulnerable to flooding (Hellman, 2015; Texier, 2008). As such, the socio-economic conditions in the city further contribute to the flood risk.

Overall, this interconnecting web of flood drivers means that there will not be a single organisation, or government department that will be able to take care of the flood problem alone. There is a need for different organisations (governmental and non-governmental) to work together, and to coordinate across the traditional arrangement of government sectors in order to pool resources and expertise.

The second reason coordination is key is that transboundary basins cross borders. Integrated River Basin Management (IRBM) is the concept of managing rivers in an integrated manner from upstream to downstream. The principles of IRBM suggest that river basins should be managed at the basin level (Wiering et al., 2010). This is to account for the fact that processes within the hydrologic boundary are connected. Considering the river basin as a whole requires the different jurisdictions through which the river crosses to coordinate to ensure compatibility of plans and balancing of interests, as well as data and information for things like flood early warning (Skoulikaris & Zafirakou, 2019). In Indonesia, there are 34 separate provinces which are sub-divided into rural regencies (kabupaten), urban cities (kota), then into districts (kecamatan) and villages. In the case of the Ciliwung, the borders being crossed are the political borders between administrative areas. The Ciliwung crosses the provinces of West Java and the Special Capital Region of Jakarta (DKI Jakarta) as well as the municipalities of Bogor City, Bogor Regency, Depok and Jakarta. To

successfully manage the Ciliwung, it is therefore necessary for local governments and organisations to coordinate across the provincial and municipal borders.

Lastly, coordination is of particular importance in multi-level governance systems. Within a country, multi-level systems consist of governments at national through to local level, and the different levels may be responsible to varying degrees. Responsibilities for aspects of flood management, for example, are often distributed across governance levels. To ensure that plans for flooding are implemented successfully, coordination is required between the vertical levels of government so that approaches are matched across scales (Dieperink et al., 2018). In Indonesia's multi-level governance system, the levels are national, provincial, regency/city, district and village. Therefore, responsibilities for flood management are divided, and vertical coordination is required to translate policy and plans into implementation at the local level.

This chapter examines the potential barriers to coordination that may be impacting on the responsible actors' ability to manage flooding in the Ciliwung River Basin.

17.2 Methodology

The findings are based on a systematic literature review. The review was conducted as part of the project *Mitigating hydrometeorological hazard impacts through transboundary river management in the Ciliwung River Basin*[1]. The aim of the project is to identify the flood-related governance challenges, and to formulate recommendations for how governance arrangements may be improved to support the management of flooding in the Ciliwung.

The literature review was conducted following the project's conceptual framework (Clegg et al., 2021). The framework partly applied that of Savenije and van der Zaag (2000) for international water sharing, and adapted it to the topic of flooding. The framework was used as a basis to identify governance challenges.

Literature was chosen based on its relevance to flood, water and river management, as well as disaster management literature which may provide useful insights for flooding. Disaster management and water management were included because of the focus of Indonesia's national frameworks on these areas. Both academic and grey literature sources were reviewed. Sources were identified through searches using Google Scholar and the University of Huddersfield's online library portal. Key word searches included 'flood management', 'disaster management', 'river management/governance' and 'water management' in combination with 'Ciliwung', 'Jakarta' and 'Indonesia'. Thus, the literature must relate to either the Ciliwung Basin, Jakarta area or Indonesia more broadly. The initial review identified 76 relevant documents of which 28 were found to have relevance to coordination and are presented in the findings. Some additional literature is included for background to each problem.

[1] www.resilientciliwung.com

17.3 Findings

17.3.1 Coordinating Sectors

The issue of flooding is not only relevant to a single government ministry or agency, but cuts across the interests of various. This might include agriculture, spatial planning and land use, climate change, and the environment, among others (Akhmouch & Calavreul, 2019). This is due to flooding being driven by, and affecting, many different aspects of society and the environment. While these government departments may have their own priorities and work plans, there is a need for these to be compatible to support an integrated approach to flood management.

In Indonesia, responsibilities for the management of flooding are distributed between government ministries/agencies, with the primary actors being the Ministry of Forestry, the Ministry of Public Works and the Disaster Management Agency (BNPB) (Ariyanti et al., 2020; Djalante et al., 2013). However, these government departments do not always coordinate effectively. For example, it is noted that in both water management and disaster management, the government departments involved tend to follow their own agendas in a fragmented manner, rather than working together (Mulyana & Prasojo, 2020; Srikadini et al., 2018). Limited coordination has been identified between specific ministries and agencies, such as between BNPB and the Ministry of Forestry by Mardiah et al. (2017).

There are several issues that may contribute to a lack of sectoral coordination. One issue is that the responsibilities of the ministries/agencies are not always well defined. For example, the Disaster Management Law is noted to not provide sufficient guidance on the roles of different actors (BNPB, 2015). Responsibilities may overlap which makes it unclear who should be doing what. This can lead to tensions between sectors, and a potential 'vacuum of responsibility' which hinders cooperation (Djalante et al., 2013). A second issue is that there is a lack of formal mechanisms in place to support cooperation between sectors. For example, there is no mechanism in place for departments involved in disaster management to coordinate on a regular basis. Where coordination does take place it is more informal (Srikadini et al., 2018). There is also a lack of guidance on how the different sectors should integrate their work. For example, there is no framework for how spatial planning should be integrated with disaster management or climate change adaptation (Das & Luthfi, 2017; Wijaya et al., 2017). These areas are highly interrelated, and this could have significant impacts for flood management. A further issue in coordinating sectors may relate to the fragmented arrangements of the legal frameworks. It is found that there is no plan focused on flood resilience available at the national level (Handayani et al., 2019). The management of flooding is relevant to both the Water Law and the Disaster Management Law. However, how the laws relate to one another is not clear. This could pose a challenge for actors coordinating on flooding (Clegg et al., 2020).

17.3.2 Coordinating Vertical Governance Levels

In 1999, Indonesia moved from a centralised to a decentralised governance system. During this time, sub-national government levels (provincial, city/regency) gained greater powers and responsibilities. Responsibilities became more distributed for many work areas, including flood management. For both water management and disaster management there are various authorities located at multiple government levels, all with different duties (Dewi & van Ast, 2017; Handayani et al., 2020). This includes the state, the province and the local sub-districts (van Voorst, 2016). In decentralised governance systems, such as this, there is a need to coordinate plans and policies through vertical levels of governance (Handayani et al., 2020). Ideally, plans and actions will be aligned for consistency. However, several issues have been identified that mean vertical coordination is a challenge.

While the previous section identified that roles and responsibilities of national ministries/agencies are not always clearly set out, the same has been identified between vertical levels of governance (Dewi & van Ast, 2017; Grady et al., 2016). This can result in similar problems where it is unclear who is responsible for what. It is noted that while there are several regulations that state the need for cooperation between government levels in place, guidance provided on how this should be achieved is not explicit (Das & Luthfi, 2017; Dewi & van Ast, 2017). Furthermore, there are no formal mechanisms in place to support effective vertical coordination (Djalante & Thomalla, 2012; Handayani et al., 2019). For example, this is apparent in the arrangements for disaster management. Grady et al. (2016) identified that disaster management agencies at national and district levels suffer from a lack of clarity on roles and responsibilities. The authors also note that policies are not fully connected between governance levels. For example, sometimes provinces and districts do not always have operational plans in place which creates a disconnect.

In terms of planning, plans should be aligned throughout the levels of governance to ensure that they connect broader national goals to action at the local level. For example, Asdak et al. (2018) note that spatial plans made at the local level should be linked with the plans set out at provincial and national levels. However, they find that spatial plans are not always well coordinated. The identified reason for this is that it is not well enforced, thus does not always take place. In addition, while agendas are set at national and provincial levels, the local government level has a key role in implementation of plans (Handayani et al., 2019). However, a lack of capacity (budgets, staffing, expertise) at the local level has been recognised to have created an implementation gap, where plans are in place but they are not always fully realised at the local level. This may also impact on coordination between levels. For example, differences in capacity between national and district disaster management authorities have been identified to hinder effective vertical coordination (Das & Luthfi, 2017; Grady et al., 2016).

17.3.3 Coordinating Within the River Basin

Basin-wide integration is required to tackle floods (Bakker, 2009). This means that to address floods in Jakarta, coordination is required with the upstream province of West Java (Sunarharum et al., 2014). As an aid for basin-wide water management and following IRBM principles, Indonesia established river basin territories (*Wilayah Sungai*, WS), of which there are 133 throughout the country. A WS is defined as “one or more basins/catchments under one authority” (Ariyanti et al., 2020). Basin planning takes place for each unit, where a strategic *Pola* and a more detailed *Rencana* plans are prepared. Flood management is included in these documents (Asian Development Bank, 2016). This approach follows basic IRBM principles, that basin planning and management takes place at the basin level (Ariyanti et al., 2020). However, this approach to the management of river basins would appear to be in contention with the local government arrangements, which prevents coordination being fully achieved. Following the decentralisation of the government, as described above, local governments gained greater freedom over their own affairs (Asdak et al., 2018; Firman, 2014). This meant that local governments could address problems relevant to them directly, and processes became more efficient as a result (van Voorst, 2016). However, Firman (2014) identified that this greater autonomy also meant that local governments become ‘inward looking’ and were not always willing to, or saw the need to cooperate with one another.

Asdak et al. (2018) identified this in terms of the spatial planning system. They note that the spatial planning systems of Bogor, Depok and Jakarta are not well integrated, associated with the independence of local authorities. This creates a problem for a consistent approach to spatial planning within the Ciliwung Basin. More recently, regulation has been introduced to mandate for more integrated spatial planning between various stakeholders in Greater Jakarta, including upstream areas of Bogor and Depok (Presidential Regulation 60/2020). Due to the recent nature of the regulation it is unclear what effect this regulation has had on coordination.

Issues of coordination may also be attributed to the upstream-downstream dynamics of the flood problem within a river basin. The flood problem is most persistent in the downstream, but requires cooperation with the upstream for management. However, as flooding is not so much a pressing issue for the upstream, they have been noted to be less engaged in coordination with the downstream (Dewi & van Ast, 2017).

There are additional issues surrounding the capacities of local governments. After decentralisation, local governments gained greater responsibilities for certain affairs, including aspects of flood management. However, some local governments do not always have the capacities to manage and implement the roles they are tasked with. Some local governments were able to develop much faster than others, which has created a disparity in capacity across borders. These capacity issues are related to coordination in several ways. Firstly, low capacity may mean that there are no resources available to back local government coordination efforts (Asdak et al., 2018). Secondly, the capacity disparity between borders may mean that areas with

greater capacity have greater influence than their less capable counterparts which can create an uneven playing field for cooperation (Firman, 2014). While recent studies have indicated that capacity disparities between regions are narrowing, it is suggested that more can still be done to address the unevenness of local capacities (Talitha et al., 2020).

17.3.4 Existing Coordination Mechanisms

River Basin Organisations (RBOs) are often suggested as a way to help overcome some of the horizontal and vertical coordination challenges within a river basin (Schmeier & Vogel, 2018; UNISDR, 2018). Therefore, focus is now turned to the mechanisms and institutions that are in place to enable and support coordination/collaboration. In Indonesia, there are several different institutions for coordination in place at different governance levels. For example, for water management at the national level, there is the National Water Council (DSDA) led by the Directorate of General Water Resources, Ministry of Public Works (the ministry responsible for water utilisation). The water council brings together ministers from various agencies, for example, planning, public works, agriculture and forestry, as well as non-government members, such as disaster management (World Bank, 2015). There is a further series of water councils at the provincial level. In addition, for each WS there is a water resources authority known as B(B)WS or Balai PSDA. In the Ciliwung, this is the BBWS for the Ciliwung and Cisadane basins. BBWS are technical implementing units of the Ministry of Public Works, and they have roles in operation and management, but also play a coordination role (World Bank, 2015). There are then TKPSDAS. These are a further type of multi-sector, multi-actor water councils and platforms for coordination at WS level that include both government and non-government actors (World Bank, 2015). The TKPSDA for the Ciliwung-Cisadane WS was involved in the preparation of the new water resources management plan for the basin by reviewing it and providing recommendations (Balai Besar Wilayah Sungai Ciliwung Cisadane, 2020). For disaster management, there is another array of platforms for coordination. At the national level there is PLANAS, the national platform for disaster risk reduction which brings together different stakeholders including ministries and agencies, civil society organisations, NGOs, private sector organisations and universities (BNPB, 2015; Djalante & Thomalla, 2012). There is also the university forum (Forum Universitas) as well as regional and village disaster risk reduction forums (Srikadini et al., 2018). For Jakarta development, there is BKSP which holds the task of planning, monitoring and coordinating development in the city (Firman, 2014; Ward et al., 2013). It also deals with cross-border related issues with West Java.

Despite this range of coordination mechanisms available, several issues have been identified with their operation. In terms of the water councils, they tend to lack authority and capacity, in particular the TKPSDAs that play a primary role in coordination at the basin level (Asian Development Bank, 2016; Dewi & van Ast, 2017).

For example, it is suggested that the TKPSDAs do not have the authority to make sure that actions that are agreed on are implemented, which limits their influence on the ground (Asian Development Bank, 2016). Furthermore, it is noted that responsibilities of basin organisations are not always clearly defined (World Bank, 2015), and some organisations have overlaps in their roles. For example, both TKPSDA and BBWS have coordination roles, which may contribute to a lack of clarity (Asian Development Bank, 2016). Resource-related issues are also identified. Funding and resource issues have also been suggested to be a problem from the PLANAS national disaster platform (Grady et al., 2016). Similarly, BKSP has been noted to suffer from a lack of resources (Firman, 2014). Further, the organisation has been suggested to lack the power to make sure coordination actually happens in practice (Dewi & van Ast, 2017).

17.4 Conclusion

This chapter has discussed the important role of coordination for the governance of complex environmental problems, and has highlighted some of the potential challenges facing successful coordination. To illustrate, the case of the Ciliwung River Basin, Java was presented. Based on the findings of a literature review, the challenges facing effective coordination in the Ciliwung were examined. The review identified that coordination challenges exist between sectors, vertically between governance levels from national to local, and horizontally between actors within the river basin. It was found that while there are many platforms for coordination, they are not always fully effective in this role.

The review revealed several common challenges facing coordination. Firstly, a lack of clarity surrounding the roles and responsibilities of different actors was found to be a reoccurring issue associated with different aspects of coordination, including sectoral coordination and vertical coordination, as well as for different basin organisations with coordinating roles. There is a need to make sure that the different actors involved, at the national level through to the local level, are clear on the functions they hold.

Issues associated with local government also appear prominent. The independence of local governments in the decentralised system is somewhat in contention with the need to coordinate cross-border to achieve integrated river basin management. As noted previously by Firman (2014), one way to improve coordination could be to provide greater incentive for local government to coordinate with one another. There is also the issue of local government capacity. Local governments often have low capacity which may prevent them from coordinating with others. Additionally, local governments have been found to be responsible for much of the implementation of flood-related measures, but they do not necessarily have the budgets to implement them. This means that while there are plans and programmes in place, they do not always get actioned at the local level. This then creates a gap in the coordination of plans throughout vertical levels. There is a need to build the capacity of local governments in coordination and implementation.

Platforms for coordination are often held as important tools for governing transboundary basins. In the case of the Ciliwung, it has been found that it is not a lack of coordination platforms that poses a challenge, in fact, there are a considerable number of organisations that provide a coordinating function with relevance to flood management. The platforms also bring together government as well as non-government actors. The issue would appear to be with the power and capacity of these organisations to bring about productive coordination, as well as to ensure agreements made are acted upon. The effectiveness of coordination platforms for river basin management has been drawn into question elsewhere (Huitema et al., 2009). One way coordination could be improved would be to make sure that the functions of each organisation are clear, and to strengthen the existing organisations to conduct their responsibilities (Asian Development Bank, 2016).

While much discussion regarding transboundary basins focuses on coordination within the basin, this review has shown that coordination challenges are not restricted to within the basin but can occur at the national level and through levels of governance. While these lie outside the basin directly, these have the potential to impact upon the function of river basin governance and management. Spatial planning for example is an important aspect to consider in managing flooding, but vertical and horizonal coordination challenges hindering effective spatial planning then have knock on effects for flood management. As suggested by Handayani et al. (2020), improved coordination in urban development could help to achieve overall greater sustainability, and could then support overall flood risk reduction.

Addressing the coordination problems identified here could help create a more enabling environment for working together. Coordination itself will not resolve the problems if budget and capacity issues are not addressed so that implementation can occur. Pushing for more collaboration, where resources are pooled and other non-actors are involved could be a way of helping to address this complexity and associated resource issues (Watson, 2004). In addition, the challenges facing coordination identified here draw into question how greater coordination and collaboration could be achieved. For example, whether it will be possible to develop greater collaboration between local administrations considering the lack of will and funding issues, or whether greater formal regulation will be required to initiate it. The decentralised governance system has allowed for greater independence of local governments, but this has not created an environment where coordination and collaboration easily exist. It will be of interest to observe the impacts of the recently implemented spatial planning regulation which presents a top-down driver for coordination, and the effects this has on working together.

This case study of governance arrangements in the Ciliwung River Basin has highlighted the complexity of achieving the coordination required to address environmental problems. Coordination is required across multiple dimensions. While coordination is not the only barrier to the governance of environmental problems, it is a prevalent and complex problem that should be considered carefully. While this study focused upon flooding, these findings may be of relevance to the governance of other environmental concerns.

The findings and conclusions expressed in this chapter are based on an extensive review of the previous studies. These will inform further empirical research that is being conducted by the same project team, who is engaging with key actors in the Ciliwung River Basin to explore how these coordination challenges can be overcome to strengthen flood risk management arrangements.

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References

Abidin, H. Z., Andreas, H., Gumilar, I., Fukuda, Y., Pohan, Y. E., & Deguchi, T. (2011). Land subsidence of Jakarta (Indonesia) and its relation with urban development. *Natural Hazards, 59*, 1753. https://doi.org/10.1007/s11069-011-9866-9

ACAPS. (2020). *Indonesia floods – Briefing note 10th January 2020*. ACAPS.

Akhmouch, A., & Calavreul, D. (2019). *Flood governance: A shared responsability*. An application of the OECD Principles on Water Governance to Flood Management, Draft edn. Organisation for Economic Co-operation and Development (OECD).

Ariyanti, V., Edelenbos, J., & Scholten, P. (2020). *Implementing the integrated water resources management approach in a volcanic river basin: A case study of Opak sub-basin, Indonesia*. Area Development and Policy. https://doi.org/10.1080/23792949.2020.1726785

Asdak, C., Supian, S., & Subiyanto. (2018). Watershed management strategies for flood mitigation: A case study of Jakarta's flooding. *Weather and Climate Extremes, 21*(September), 117–122.

Asian Development Bank. (2016). *River Basin management planning in Indonesia: Policy and practice*. Philippines.

Bakker, M. H. N. (2009). Transboundary river floods and institutional capacity. *Journal of the American Water Resources Association, 45*(3), 553–566.

Balai Besar Wilayah Sungai Ciliwung Cisadane. (2020). Sinkronisasi Program & Kegiatan Penglolaan SDA WS Ciliwung Cisadane. PU. https://sda.pu.go.id/balai/bbwscilicis/sinkronisasi-program-kegiatan-pengelolaan-sda-ws-ciliwung-cisadane/. Accessed 3 Nov 2021.

BNPB. (2015). Indonesia's Disaster Risk Management Baseline Status Report 2015. Towards Identifying National and Local Priorities for the Implementation of the Sendai Framework for Disaster Risk Reduction (2015–2030). Badan Nasional Penanggulangan Bencana/ National Disaster Management Authority,

Cambridge Dictionary. (2022). *Coordination*. Cambridge Dictonary. dictionary.cambridge.org/dictionary/english/coordination, Online.

Cao, A., Esteban, M., Valenzuela, V. P. B., Onuki, M., Takagi, H., Thai, N. D., & Tsuchiya, N. (2021). Future of Asian deltaic megacities under sea level rise and land subsidence: Current adaptation pathways for Tokyo, Jakarta, Manila, and Ho Chi Minh City. *Current Opinion in Environmental Sustainability, 50*(June 2021), 87–97.

Clegg, G., Haigh, R., Amaratunga, D., & Rahayu, H. P. (2020). *Transboundary river and flood governance: A comparison of arrangements in Indonesia and Europe*. University of Huddersfield Unpublished Project Report.

Clegg, G., Haigh, R., Amaratunga, D., Rahayu, H. P., Karunarathna, H. U., & Septiadi, D. (2021). A conceptual framework for flood impact mitigation through transboundary river management. *International Journal on Advanced Science, Engineering and Information Technology, 11*(3), 880–888.

Das, A., & Luthfi, A. (2017). Disaster risk reduction in post-decentralisation Indonesia: Institutional arrangements and changes. In R. Djalante, M. Garschagen, F. Thomalla, & R. Shaw (Eds.), *Disaster risk reduction in Indonesia: Process, challenges and issues*. Springer.

Dewi, B. R. K., & van Ast, J. A. (2017). Institutional arrangements for integrated flood management of the Ciliwung-Cisadane River Basin, Jakarta metropolitan area, Indonesia. In M. P. van Dijk, J. Edelenbos, & K. van Rooujen (Eds.), *Urban governance in the realm of complexity*. Practical Action Publishing.

Dieperink, C., Mees, H., Priest, S., Ek, K., Bruzzone, S., Larrue, C., & Matczak, P. (2018). Managing urban flood resilience as a multilevel governance challenge: An analysis of required multilevel coordination mechanisms. *Ecology and Society, 21*(1), 31. https://doi.org/10.5751/ES-09962-230131

Djalante, R., & Thomalla, F. (2012). Disaster risk reduction and climate change adaptation in Indonesia: Institutional challenges and opportunities for integration. *International Journal of Disaster Resilience in the Built Environment, 3*(2), 166–180.

Djalante, R., Holley, C., Thomalla, F., & Carnegie, M. (2013). Pathways for adaptive and integrated disaster resilience. *Natural Hazards, 69*, 2105–2135.

Dwirahmadi, F., Rutherford, S., Phung, D., & Chu, C. (2019). Understanding the operational concept of a flood-resilient urban community in Jakarta, Indonesia, from the perspectives of disaster risk reduction, climate change adaptation and development agencies. *International Journal of Environmental Research and Public Health, 16*(3993). https://doi.org/10.3390/ijerph16203993

Emerson, K., Nabatchi, T., & Balogh, S. (2011). An integrative framework for collaborative governance. *Journal of Public Administration Research and Theory, 22*(1), 1–29.

Evans, J. P. (2012). *Environmental governance. Routledge introductions to the environment*. Routledge.

Firman, T. (2014). Inter-local-government partnership for urban management in decentralizing Indonesia: From below or above? Kartamantul (greater Yogyakarta) and Jabodetabek (greater Jakarta) compared. *Space and Polity, 18*(3), 215–232.

Grady, A., Gersonius, B., & Makarigakis, A. (2016). Taking stock of decentralised disaster risk reduction in Indonesia. *Natural Hazards and Earth System Sciences, 16*(9), 2145–2157.

Handayani, W., Fisher, M. R., Rudiarto, I., Setyono, J. S., & Foley, D. (2019). Operationalizing resilience: A content analysis of flood disaster planning in two coastal cities in Central Java, Indonesia. *International Journal of Disaster Risk Reduction, 35*(101073).

Handayani, W., Chigbu, U.E., Rudiarto, I., Putri, I.H.S. (2020). Urbanization and increasing flood risk in the northern coast of Central Java-Indonesia: An assessment towards better land use policy and flood management land (9):343.

Hellman, J. (2015). Living with floods and coping with vulnerability. *Disaster Prevention and Management, 24*(4), 468–483.

Huitema, D., Mostert, E., Egas, W., Moellenkamp, S., Pahl-Wostl, C., & Yalcin, R. (2009). Adaptive water governance: Assessing the institutional prescriptions of adaptive (co-)management from a governance perspective and defining a research agenda. *Ecology and Society, 14*(1), 26.

Kefi, M., Mishra, B. K., Masago, Y., & Fukishi, K. (2020). Analysis of flood damage and influencing factors in urban catchments: Case studies in Manila, Philippines, and Jakarta, Indonesia. *Natural Hazards, 104*, 2461–2487.

Mardiah, A. N. R., Lovett, J. C., & Evanty, N. (2017). Toward integrated and inclusive disaster risk reduction in Indonesia: Review of regulatory frameworks and institutional networks. In R. Djalante, M. Garschagen, F. Thomalla, & R. Shaw (Eds.), *Disaster risk reduction in Indonesia: Progress, Challenges and Issues*. Springer International.

Margerum, R. D., & Robinson, C. J. (2015). Collaborative partnerships and the challenges for sustainable water management. *Current Opinion in Environmental Sustainability, 12*(February 2015), 53–58.

Moe, I. R., Kure, S., Januriyadi, N. F., Farid, M., Udo, K., Kazama, S., & Koshimura, S. (2017). Future projection of flood inundation considering land-use changes and land subsidence in Jakarta, Indonesia. *Hydrological Research Letters, 11*(2), 99–105.

Mulyana, W., & Prasojo, E. (2020). Indonesia urban water governance: The interaction between the policy domain of urban water sector and actors network. *International Journal of Sustainable Development and Planning, 15*(2), 211–218.

Presidential Regulation. (60/2020). Tentang rencana tata ruang kawasan perkotaan jakarta, bogor, depok, tangerang, bekasi, puncak, dan cianjur. 60/2020. [*Concerning spatial plan for the urban area of jakarta, bogor, depok, tangerang, bekasi, puncak, and cianjur (in Bahasa Indonesia)*]

Remondi, F., Burlando, P., & Vollmer, D. (2016). Exploring the hydrological impact of increasing urbanisation on a tropical river catchment of the metropolitan Jakarta, Indonesia. *Sustainable Cities and Society, 20*, 210–221.

Savenije, H. H. G., & van der Zaag, P. (2000). Conceptual framework for the management of shared river basins; with special reference to the SADC and EU. *Water Policy, 2*(2000), 9–45.

Schmeier, S., & Vogel, B. (2018). Ensuring long-term cooperation over transboundary water resources through joint river basin management. In S. Schmutz & J. Sendzimir (Eds.), *Riverine ecosystem management: Science for governing towards a sustainable future*. Springer Open.

Skoulikaris, C., & Zafirakou, A. (2019). *River basin management plans as a tool for sustainable Transboundary River basins' management* (pp. 1–14). Environmental Science and Pollution Research. https://doi-org.libaccess.hud.ac.uk/10.1007/s11356-019-04122-4

Srikadini, A. G., Hilhorst, D., & van Voorst, R. (2018). Disaster risk governance in Indonesia and Myanmar: The practice of co-governance. *Politics and Governance, 6*(3). https://doi.org/10.17645/pag.v6i3.1598

Sunarharum, T. M., Sloan, M., & Susilawati, C. (2014). Re-framing planning decision-making: Increasing flood resilience in Jakarta. *International Journal of Disaster Resilience in the Built Environment, 5*(3), 230–242.

Talitha, T., Firman, T., & Hudalah, D. (2020). Welcoming two decades of decentralization in Indonesia: A regional development perspective. *Territory, Politics, Governance, 8*(5), 690–708.

Texier, P. (2008). Floods in Jakarta: When the extreme reveals daily structural constraints and mismanagement. *Disaster Prevention and Management, 17*(3), 358–372.

Tjasyono, H. K. B., Gernowo, R., Sri Woro, B. H., & Ina, J. (2008). *The character of rainfall in the Indonesian monsoon*. Paper presented at the International Symposium on Equatorial Monsoon System.

UNISDR. (2018). *Implementation guide for addressing water-related disasters and transboundary cooperation: Integrating disaster risk management with water management and climate change adaptation*. Words into Action Guidelines. United Nations.

Siswanto, van Oldenborgh, G. J., van der Schrier, G., Lenderink, G., & van den Hurk, B. (2015). Trends in high-daily precipitation events in Jakarta and the flooding of January 2014. In S. C. Herring, M. P. Hoerling, J. P. Kossin, T. C. Peterson, & P. A. Stott (Eds.), *Explaining extreme events of 2014 from a climate perspective* (Vol. 96). American Meteorological Society.

van Voorst, R. (2016). Formal and informal flood governance in Jakarta, Indonesia. *Habitat International, 52*, 5–10.

Ward, P. J., Pauw, W. P., van Buuren, M. W., & Marfai, M. A. (2013). Governance of flood risk management in a time of climate change: The cases of Jakarta and Rotterdam. *Environmental Politics, 22*(3), 518–536.

Watson, N. (2004). Integrated river basin management: A case for collaboration. *International Journal of River Basin Management, 2*(4), 243–257.

Wiering, M., Verwijmeren, J., Lulofs, K., & Feld, C. (2010). Experiences in regional cross border co-operation in river management. Comparing three cases at the Dutch-German border. *Water Resources Management, 24*, 2647–2672.

Wijaya, N., Bisri, M. B. F., Aritenang, A. F., & Mariany, A. (2017). Spatial planning, disaster risk reduction, and climate change adaptation integration in Indonesia: Progress, challenges, and approach. In R. Djalante, F. Thomalla, M. Garschagen, & R. Shaw (Eds.), *Disaster risk reduction in Indonesia: Progress, challenges and issues*. Springer.
World Bank. (2015). *Toward efficient and sustainable river basin operational services in Indonesia*. World Bank.

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Chapter 18
Transformative Solutions in the Global South: Addressing Solid Waste Management Challenges in Jakarta Through Participation by Civil Society Organizations?

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Abstract Global solid waste generation is steeply increasing. Currently, high-income countries are responsible for the utmost per capita waste generation, but as economies of the Global South are growing rapidly, their waste is expected to triple by 2050. Simultaneously, countries such as Indonesia did not manage to align their socio-economic development with a sustainable solid waste management (SWM) and therefore contribute significantly to waste debris. Community participation is recognized by governments and civil society actors as an inclusive and transformative tool to manage exacerbating environmental issues. Urban regions intensify the challenges of solid waste generation, as is the case in Jakarta. Therefore, sustainable waste management is subject to an increasing number of civil society organizations.

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The study analyzed how participative processes within SWM efforts in Jakarta are executed, to investigate potentials and obstacles that evolve during the implementation. Another aim was to explore the heterogenous perspectives of participation. Semi-structured interviews were conducted with civil society actors, including non-governmental organizations (NGOs), social enterprises, and waste banks to get insights into participatory procedures in Jakarta. The results reveal that the waste problems in Jakarta are complex, interrelated, and multi-layered. While participatory procedures have been acknowledged by the organizations to be highly relevant for waste management, such approaches should be adapted depending on the local circumstances and actors. Some of the obstacles and limitations include deficiency of infrastructure for SWM, lack of government engagement, and general awareness. Therefore, participatory formats should be combined, e.g., with suitable structures and balanced engagement of all relevant actors. Among others, further empirical research is needed to get a better understanding of the effectiveness of participation for efforts addressing environmental pollution. Such research can reveal (hidden) potentials of participative formats for sustainable waste management in urban or metropolitan areas in the Global South.

Keywords Community participation · Civil society organizations · Solid waste management (SWM) · Jakarta · Governance

18.1 Introduction

The impacts of human activities on the natural environment have grown to a point where they can be detected anywhere on earth, which has been known for several decades (Thompson et al., 2004; Crutzen, 2006; Steffen et al., 2016, 2015; Baldwin et al., 2016). Through the current economic production and consumption systems (make, transport, use, dispose), the loss of natural resources is increasing (Prieto-Sandoval et al., 2018), while mismanaged products that are, e.g., neither recycled nor reused, contribute to the accumulation of waste debris thereby causing severe environmental pollution. Global solid waste generation is steeply increasing. In 2012 the global waste production was estimated to be 1.30 billion tons (Hoornweg & Bhada-Tata, 2012), whereas in 2016 it reached 2.01 billion tons and it is expected to increase to 3.40 billion tons per year over the next 30 years (Kaza et al., 2018). Moreover, adequate waste management is rarely available in low-income countries, which highly rely on open dumpsites (Yang et al., 2018) as well as open waste burning (Maalouf et al., 2020). While high-income countries are responsible for the utmost per capita waste generation (Kaze et al., 2018), rapidly growing economies in the Global South, such as Indonesia are struggling with sustainable solid waste management (SWM) and therefore contribute significantly to waste debris in the environment. This is even more critical since the amount of mismanaged plastic waste per year places Indonesia second with 3.2 million tons within a global comparison (Jambeck et al., 2015: 769). The acute waste problem has resulted in

several disasters in Indonesia. Examples are the Bantar Gebang, Bekasi landfill fire in 2015, and the waste landslide at Leuwigajah dumpsite in Bandung in 2005. The latter tragedy was one of the deadliest in Indonesia, causing 71 houses to be buried and 143 people to be killed (Lavigne et al., 2014).

Cities of the Global South contribute increasingly to a steep growth of waste (Myllylä, 2001: 198; Yang et al., 2018: 237). However, cities are the central settlements, where more than half of humanity is living (UN DESA, 2015: 7) and where both problems as well as solutions in environmental, social, and economic areas evolve. While urbanization in Indonesia is increasing with over half of the population already living in urban settlements (Salim & Hudalah, 2020: 179), the amount of waste, and in specific solid waste, in the urban areas, such as Jakarta, is growing substantially (Dethier, 2017: 75).

Active community engagement is recognized as one central element for SWM, especially in countries with rapidly developing economies, such as Indonesia (Dhokhikah et al., 2015; Dhokhikah & Trihadiningrum, 2012). Newig and Kvarda (2012: 29) state that the growing interest in participative approaches can be linked to the complex and uncertain environmental and sustainability challenges. However, questions arise around the actual inclusive implementation and the limitations of participation to address environmental challenges.

Therefore, this chapter analyses how participative processes within waste management efforts in Jakarta are implemented. Thereby, the study addresses the following questions: *How is participation perceived by the selected civil society organizations? What are the potentials of participatory approaches as well as obstacles and limitations within SWM in Jakarta?*

18.2 Research Area and Methodology

Jakarta is the second largest urban agglomeration worldwide (Martinez & Masron, 2020: 1). The Special Capital Region of Jakarta (*Daerah Khusus Ibukota*, DKI) takes up an area of roughly 664 km^2 and the population is estimated to be around 10.56 million in 2019 (Martinez & Masron, 2020: 2). Including the neighboring cities, Bogor, Depok, Tangerang, and Bekasi, the capital is being transformed into a megacity, named Jabodetabek, an acronym of all the city names including Jakarta (see Fig. 18.1).

The need to improve solid waste management in Jakarta is manifested by a lack of landfill capacities, which are not able to keep up with the solid waste production. In the district of Bekasi, mountains of trash are piling up and being overloaded, as Jakarta is using the landfill Bantar Gebang in Bekasi. The landfill's capacity is around 6.000 tons per day, however, the waste generated in Jakarta amounts to over 7.000 tons per day (Putri et al., 2018: 2141). These aggravating challenges call for "more flexible, adaptive forms of governance" (Newig & Kvarda, 2012: 29). Therefore, potentials and obstacles of participatory forms to address the struggle to manage solid waste in Jakarta are the focal point of this study.

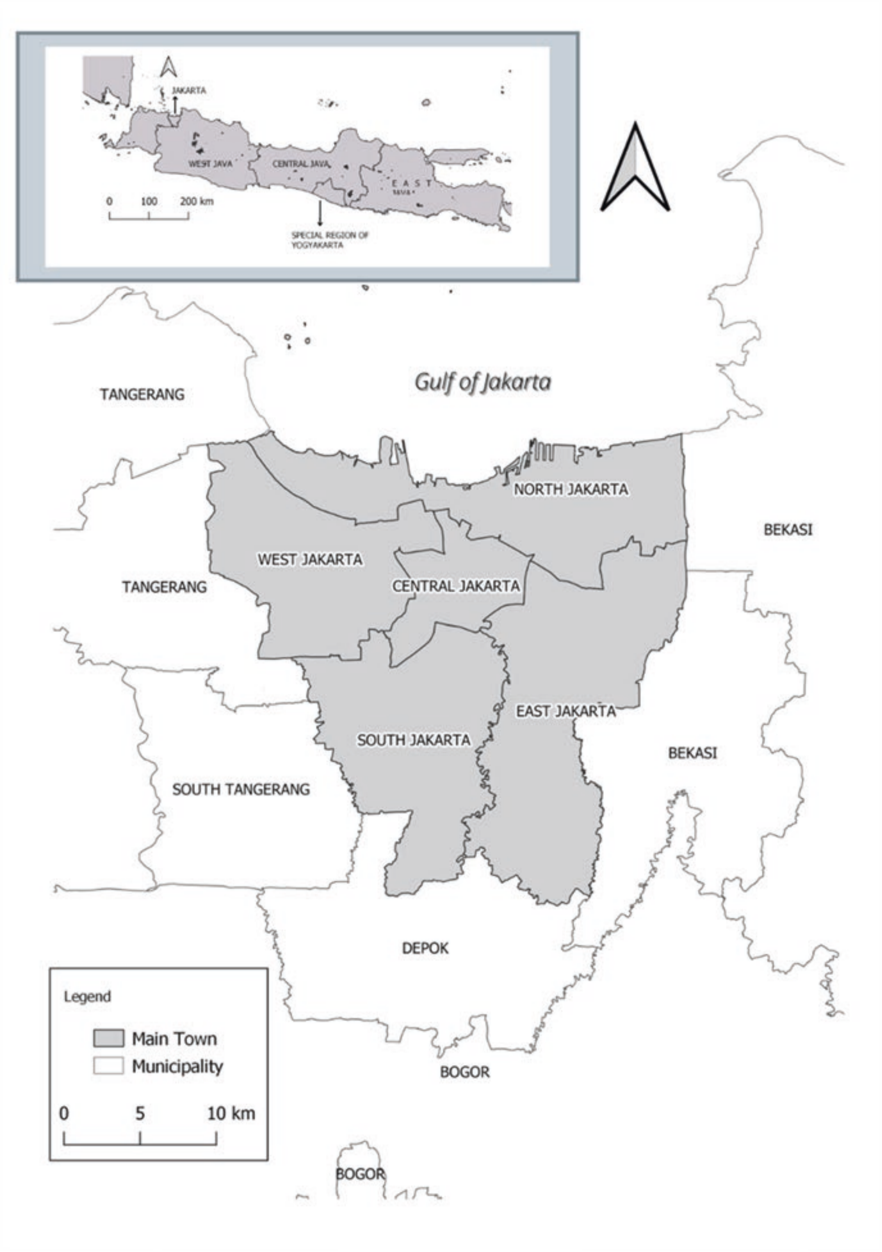


Fig. 18.1 Map of Jakarta DKI and the Metropolitan Area, Jabodetabek. (Source: Designed by Syarifah using Rupa Bumi Indonesia, 2021)

The study used an explorative approach by conducting semi-structured in-depth interviews. Civil society organizations concerned with waste or waste management in Jakarta have been selected for the research study. This target group has been chosen due to their increasing number in recent years and their prominent role in urban environmental topics as well as for community involvement (Gemmill & Bamidele-Izu, 2002). Therefore, representatives out of three different waste bank types (community, government, and religious), an actor from *Ikatan Pemulung Indonesia* (IPI) (translated: scavenger association), three NGOs, and three social enterprises that work closely with the local communities to implement measures addressing waste management challenges in Jakarta, participated in the research study. Due to the COVID-19 pandemic and travel restrictions, except for one, the interviews have been conducted as video interviews. The interviews were structured as follows: At the beginning of each conversation, an introduction of the researcher, the research, and the purpose of the interview was given as well as ethical considerations have been addressed. The questionnaire was divided into three sections, to gather input about (a) the organization and the actor, (b) the perceptions of participation, sustainability/sustainable development, and the relevance of community participation for sustainable waste management. The main section (c) asked about the participative process, including the strategies and activities to achieve sustainable waste management, the participating actors, organizations and groups, their collaborations and challenges to involve different actors (e.g., citizen, industry, government) as well as the requirements to overcome these. Finally, the respective representatives have been asked about the contribution of participation to sustainable waste management and the legal regulations for SWM, which could support the involvement of different actors. Through this structure, a baseline for the data analysis was provided (see Appendix). However, the research conducted within this study does not claim to be representative for Jakarta.

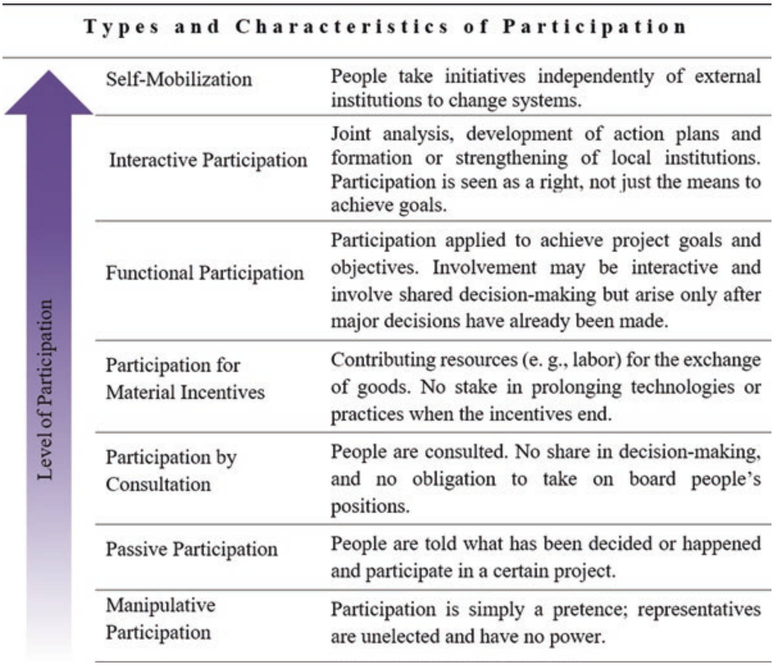
The approach of video interviews helps to overcome geographical boundaries, it is cost-effective, time-efficient, and allows more flexibility for the participants as well as the researcher since no one has to travel to a certain location. Besides accessibility to participants, another advantage is the option of being in a comfortable space that helps the interviewee to talk more openly about certain topics. However, being able to choose one's own space may lead to more distractions or less privacy. Further disadvantages include technical difficulties and poor internet connection. Moreover, by conducting video interviews, the researcher is limited in observing physical response to body language and emotional hints (Gray et al., 2020: 1297 f.). Additionally, the reliability of qualitative research is weakened, since the procedure depends on the prior knowledge of the interviewee, thereby challenging the assessment of the reliability (Carr, 1994: 719). Therefore, a comprehensive preliminary analysis of the topic and thus extensive preparation for the investigation has been carried out. Furthermore, the socio-linguistic interview situation being conducted in either English or Bahasa Indonesia due to the interviewer's language competencies might have influenced the findings.

The method of qualitative content analysis has been chosen to analyze and discuss the empirical data collected through the interviews. By applying a qualitative content analysis, the interview transcripts have been categorized using deductive as well as inductive categories. Mayring (2014) argues that the method thereby follows a mixed methodology approach. The qualitative content analysis focuses on outlining "meaning in context" (Schreier, 2014: 174) and developing a category system (Kuckartz, 2018: 29). The categories are selected, defined, structured, and in a later step revised as well as summarized into main categories and subcategories, which represent the most relevant results.

18.3 Conceptual Framework

Addressing environmental challenges within the concept of governance is not only a further task placed on governments. In particular, Lemos and Agrawal (2006: 298) explain that environmental governance includes "national policies and legislations, local decision-making structures, transnational institutions and environmental NGOs". As environmental governance in a democratic system is an integrative system, it operates in a – preferably balanced – collaborative manner "to drive sustainable living" (Wijayanti & Suryani, 2015: 173). In a relatively newly established democracy, such as Indonesia, civil society groups can play a key role in promoting change (Antlöv et al., 2010: 420). In terms of reducing waste pollution in Jakarta, a similar observation can be made, since the organizations interviewed only represent some examples. There are several waste banks, NGOs as well as social enterprises and start-ups evolving with the objective to address environmental problems such as waste pollution. However, the involvement of civil society actors in governance in Indonesia depends highly upon political will. Hence, opportunities for the engagement in governance by NGOs and other civil society organizations can evolve, when government staff, from the executive or legislative branch, are inclined to engage with citizens (Antlöv et al., 2010: 436).

Within the discourse regarding participatory approaches, there are various positions. Some criticize such modes of collective decision-making (Greven, 2009; Krüger, 2021; Michelsen & Walter, 2013; Parfitt, 2004). In this regard, it is often argued that such approaches have the tendency to be heavily time-consuming (Lawrence & Deagon, 2001), while also being questionable in their achievements and effectiveness (Bora, 1994; Irvin & Stansbury, 2004). Contrary, other scholars promote and encourage participation (Arnstein, 1969; Dhokhikah et al., 2015; Habermas, 1981; Pretty, 1995) for many reasons. Motives for participation are manifold, ranging from empowerment to strengthening the commitment for a project, distributing the responsibility, and creating ownership (Reed, 2008; Richards et al., 2004). Thus, such authors argue that it can lead to increased resilience in the event



Types and Characteristics of Participation

Level of Participation	Type	Characteristics
	Self-Mobilization	People take initiatives independently of external institutions to change systems.
	Interactive Participation	Joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve goals.
	Functional Participation	Participation applied to achieve project goals and objectives. Involvement may be interactive and involve shared decision-making but arise only after major decisions have already been made.
	Participation for Material Incentives	Contributing resources (e. g., labor) for the exchange of goods. No stake in prolonging technologies or practices when the incentives end.
	Participation by Consultation	People are consulted. No share in decision-making, and no obligation to take on board people's positions.
	Passive Participation	People are told what has been decided or happened and participate in a certain project.
	Manipulative Participation	Participation is simply a pretence; representatives are unelected and have no power.

Fig. 18.2 Types and characteristics of participation. (Source: Own illustration adapted from Pretty, 1995)

of unintended effects while more experiences and resources of the local people as experts of their own living environment can be considered (Newig & Kvarda, 2012; Rifkin & Kangere, 2002).

There are a variety of practices, initiatives, and programs claiming to “do participation”, as nowadays, participation is used as a mainstream term, with no clear unifying definition (see Newig & Kvarda, 2012: 30–32 for further elaborations). In the attempt to specify modes and types of participation, many models and typologies have been developed, one well-known example is the ladder of participation by Arnstein (Cornwall, 2008: 270; Gaber, 2019). The ladder demonstrates the different types of participation with each step showing an increasing degree of participation. However, this typology is rather for those on the receiving end, focusing on the individual who is supposed to participate. Another topology is the one developed by Pretty (1995) (see Fig. 18.2) which is directed to the ones who use participatory methods (e.g., governments, NGOs, scientists). To understand the different perceptions and motivations for applying and adopting participatory approaches, Pretty's typology can be used (see section five).

18.4 The Role of Civil Society Actors in Solid Waste Management in Jakarta

Solid waste management in Indonesia includes both the formal and informal sectors and is being handled through a collection-transportation-disposal system (Putri et al., 2018: 2141). Municipal agencies and formal businesses are included in the formal sector, whereas activities in the informal sector are handled by small businesses, groups, and individuals (Aprilia et al., 2012: 71). These actors are neither being regulated by formal administrations, nor are these registered. Lestari and Trihadiningrum (2019) specify the technical and non-technical challenges within SWM in Jakarta. The technical issues include: (1) insufficient separation of solid waste and its transportation, (2) lack of technical elements of transport, (3) lack of sufficient recycling facilities, and (4) the declining capacity of the Bantar Gebang landfill.

The non-technical issues evolve through social problems, leading to a lack of waste separation by the communities (Lestari & Trihadiningrum, 2019: 3). Further, Shekdar (2009: 1447) highlights that "a systemic effort is necessary to improve various factors, including policy and legal frameworks, […] technology, human resource development, and public participation and awareness" for a sustainable SWM system.

For waste management, the Indonesian government has established various regulations and policy instruments. The core of the legislative framework in waste management in Indonesia is regulated in Law 18/2008 on Waste Management (Damanhuri et al., 2014). This law defines under Article 2 (1) three types of waste, namely domestic waste, domestic waste equivalents, and specific waste. Under chapter nine, article 28 the role of community is defined. In specific article 28 (2) stipulates public participation through:

> "a. proposals, considerations, and suggestions to the government and/or local governmentLocal governments; b. Waste managementWaste management policiesPolicies; and/or c. Suggestion and opinion in waste dispute resolution." (Republic of Indonesia 2008)

At the ministry level, there is a Regulation of the Minister of Environment of the Republic of Indonesia 13/2012 concerning Guidelines for implementing Reduce, Reuse, and Recycle (3R) through waste banks. The regulation states that the community is one of the main actors in the waste bank implementation with full support from local government. The main purpose of waste banks is to empower communities to create socio-economic independence (Shareza et al., 2020).

Of particular note is the narrative that "instead of promoting the city for the people from a top-down perspective, a more sensible way of city-building is empowering people and supporting their initiatives" (Cabannes et al., 2018: 35). Consequently, the involvement of civil society organizations in urban environmental governance is regarded as important. At the same time, for civil society actors to realize and contribute to transformation at a higher scale, they need to participate in

governance and politics (Court et al., 2006: 10; Antlöv et al., 2010: 419 f.; Pomponi and Mencaster 2016; Prendeville et al., 2018).

The range of persons involved in civil society is broad, including individuals, groups, religious, political, and academic institutions as well as NGOs and social enterprises. Among the key actors in environmental governance concerning SWM in Indonesia are NGOs, social enterprises, and waste banks. Foo (2018: 76) argues that "nongovernmental organizations have taken on prominent roles in delivering environmental services in cities". In Indonesia, NGOs are involved in various parts of governance, ranging from facilitators of meetings organized by the government to collaborations with governments "to draft new laws and regulations, to independent advocacy campaigns on a variety of public issues" (Antlöv et al., 2010: 429). Social enterprises, a relatively new concept (Stratan, 2017: 20), are motivated by social purposes for their economic engagement and business activities (Laville et al., 2015: 6; Nascimento & Salazar, 2020). Through their two-folded purpose, providing social benefits and economic growth, social enterprises can support communities to build up financial growth while addressing local issues (Seelos & Mair, 2005; Kim & Lim, 2017: 2). The third actor group, waste banks, provides a structure, where people can sell their collected and sorted solid waste (such as paper, plastic, metal) for a certain amount of money (Rahmasary et al., 2021). In Jakarta waste banks are being promoted, as they are considered "to become a feasible option to improve the recycling rate and waste management in the city" (Putri et al., 2018: 2140).

18.5 Participation: A Tool for Transformative Solutions?

To address the research questions, core categories have been defined (see Table 18.1). First, the perceptions of participation are displayed and discussed. Hereby, the collaborations with other actors are incorporated. Second, the perceived potentials of participatory approaches for the activities of the civil society organizations are elaborated and third, obstacles and limitations for SWM in Jakarta are discussed.

18.5.1 Perceptions of Participation

The results regarding the perceptions of participation show the vague meanings of the term. Most of the interviewees understood participation similarly, e.g., as "taking part in something or being involved in an activity or initiative or any idea. And not only participating but also contributing to reaching the objectives for the goal of that certain activity" or "participation means you get involved". One of the waste bank representatives had an advanced understanding or definition of participation,

Table 18.1 Code system with main and subcategories

Code system
About the organization
Activities and strategies for SWM
Major challenges in Jakarta
Perceptions of participation
Passive participation
Functional participation
Perception of sustainability/sustainable development
Potentials of participation
Collaborations
Academia
Civil society
Government
Industry/private sector
Challenges and obstacles regarding participation
Lack of awareness
Lack of infrastructure
Socio-economic issues
Government involvement
Conflicting interests
Limitations
Regulations for SWM
How to overcome the challenges

Source: Own illustration

which implied going beyond the involvement within an event or initiative and being part of the reflexive process, e.g., after a program has ended. When linking participation to waste management, it was described as being: "about how the communities segregate their waste. […] And then how is the awareness also, they're not using plastic […], they have their own tumbler, and […] they bring their own containers."

This quote highlights two aspects of participation in waste management, not only that the current end of the product cycle is managed properly through segregation, but also the matter of using more sustainable products to reduce and avoid waste.

Activities linked to participation have also been categorized by the representatives of the civil society organizations in scales, with the examples focusing mainly on a "small" scale. In this regard it was highlighted "for the small scale, we can manage our waste, like [through] composting". Another example for a small action as a means to participate in waste management that was shared was to "reduce plastic straws". The contribution of community participation on a larger scale was stated to contribute, e.g., "to the local system in RT [*Rukun Tetangga*, translated: neighborhood] or RW [*Rukun Warga*, translated: hamlet]. And then also we can address waste management. In the specific community groups, there are internal motivations to do sustainable waste management […]. [That] is what we are trying to

address". By focusing on internal motivations, the interviewee added "we can find the most affordable way to make community groups work on their own waste management system". In this case participation is perceived as a way to empower people through their intrinsic motivation. While these examples of the initiated categorization leave many gaps, they can be related to the different types and levels of participation. Taking Pretty's typology into consideration, one can argue that the perceptions and understandings of participation of the interviewees can be located mainly within the 'passive participation' (people get involved in existing projects/ideas) and 'functional participation' (people get involved to meet project aims more effectively). The organizations, which actively and collaboratively engage in creating a better environment by addressing waste management challenges can be located in 'interactive participation' (Fig. 18.3). Hence, mapping the perceptions of participation as well as the enforced participatory activities in Pretty's typology helps to identify the motivations of the civil society organizations who apply participatory methods. However, the presented division of different levels and types of participation is rather ambiguous, as participatory processes depend on the understanding of the participating actor.

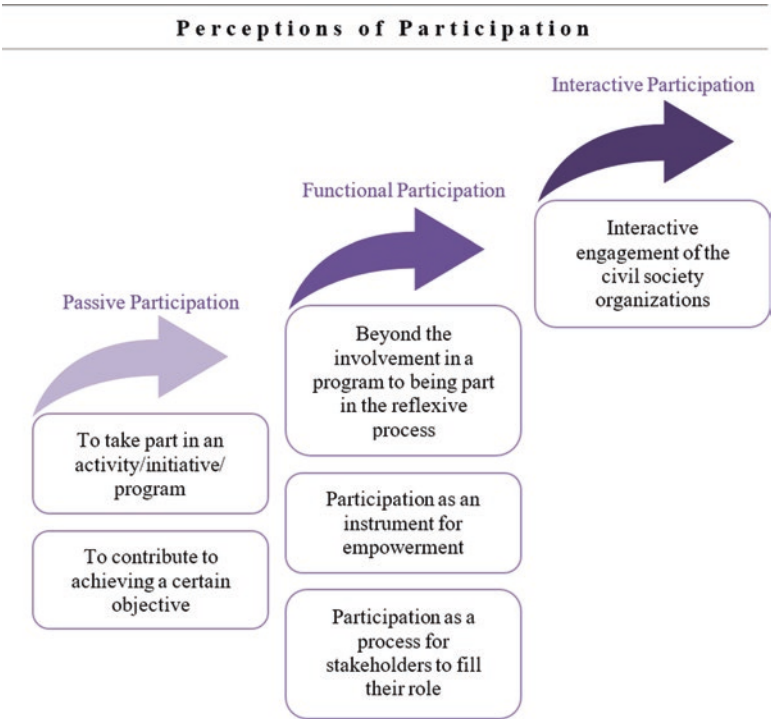


Fig. 18.3 Overview of the key results regarding the perceptions of participation of the interviewees. (Source: Own illustration)

To further understand the participatory approaches of the organizations, their collaborations for addressing waste management challenges in Jakarta have been categorized (see Table 18.1). Participation was also perceived as a "puzzle" where stakeholders can fill in their role and complement each other. It was pointed out by an interview partner that "[…] if we talk about sustainable waste management, there has to be active participation from all actors. […] Let's say if the community has participated and the government only does their daily tasks; the waste problem won't be solved". Hence, the involvement with and participation of the relevant actors is recognized as key to sustainably addressing waste pollution in Jakarta. The interviews reveal that the key actors for the organizations are civil society (including NGOs, local community groups, community leaders RW/RTs, and citizens), government, private sector, industry, and academia. While all interviewed organizations mentioned that the largest participating group are local communities, it was also stated that "it depends on the project, because each project has its own specific target audience". Therefore, there are different activities, each with different levels of involvement. Depending on the type of participation (Pretty, 1995) the participatory format used in practice can only be inclusive to a certain degree (Cornwall, 2008). This has also been documented by Turnhout et al. (2010: 4), who comment that "participation is inevitably selective when it comes to who is able to participate". Therefore, the formats of participation cannot guarantee a meaningful inclusion of all citizens (Turnhout et al., 2010; Díaz-Reviriego, 2019). The normative claim of having to pursue the participation of all stakeholders or a fully inclusive approach can in reality be overwhelming if not impossible. This was also perceived by a representative of an NGO, who argues that each actor and actor group can conduct participation based on their capacity and role. In this regard, Pellizzoni (2003: 16) emphasizes that "the question is not how much participation, but what kind of participation, by whom, to which purposes". Thus, a more efficient approach is to adjust the level and type of participation to a certain objective as well as local circumstances.

18.5.2 Mapping Potentials, Obstacles, and Limitations of Participation for SWM in Jakarta

The potentials of community participation overall were rated as high by the interviewees. In the basic sense of enabling the proper segregation and delivery of waste to the waste banks, it is relevant for SWM. Furthermore, a member of a waste bank mentioned that in the introduction phase of waste banks in Indonesia, there were neither sufficient funds nor enough employees to fully start the operation. Therefore, at that stage, participation of communities and community-based networks was essential to begin. This example shows that participation at the grassroot level can have an influence to enhance or even enable government-led activities.

Beyond that, various interviewees reckon that citizens have power that goes far beyond separating household trash. Interviewees recognized that individuals and community groups have the power to apply pressure on companies and politicians by means of social media. In a society in which 56% have active social media accounts, social media is a strong platform to communicate (Ida et al., 2020) and enable community participation.

Moreover, interviewees expressed the opportunity of community participation to make use of collective intelligence. Citizens are accepted as experts of their environment that know the resources and means of the local communities best. It was further mentioned that community participation can empower people to become independent, to find their own solutions for local problems, and to become "local leaders". Therefore, they are no longer reliant on outside actors to identify problems and present answers. Consequently, by working with communities as well as by encouraging citizens to participate in the solution process, the organizations are providing structures that enable the local people to act as "agents of change" (Cox & Johnson, 2010: 132; WBGU, 2011: 256; Crowe et al., 2016: 114).

However, participation is not regarded as a panacea that alone can solve the enormous problems related to SWM in Indonesia (Table 18.2). It was most commonly described as a relevant part of the solution that needs to be supplemented with other procedures. A number of interviewees mentioned that basic infrastructure regarding waste management is imperative to encourage communities to participate and to continue to do so. In places that lack any kind of waste management people resign and become indifferent to the issue, starting to litter because there are no options. Padawangi (2014: 34) further highlights that "urban spaces are both social and physical. Calls to change life and society mean nothing without the appropriate space". Thus, without a suitable structure, the SWM problems in Jakarta cannot be fully addressed.

Table 18.2 Overview of potentials of participation as well as obstacles and limitations of SWM using interview data

Potentials	Obstacles & limitations
Enabling sufficient segregation and delivery of waste	Lack of SWM infrastructure
To "kickstart" activities and programs	Lack of government involvement, commitment, and law enforcement
Empowerment of local people	Lack of awareness and education regarding the general waste problems
Increasing awareness and understanding of the waste challenges	Socio-economic challenges (especially regarding low-income communities)
Increasing project efficiency and sustainability	Lack of interest to make a change (especially middle- and high-income communities)
Influence of local leaders (RT, RW, religious, cultural)	

Source: Own illustration

Onyanta (2016: 504) further points out that the willingness to participate in SWM activities, such as recycling depends upon, e.g., information as well as local infrastructure for waste management, including the availability of facilities. Moreover, another barrier is that a sense of responsibility and the resulting willingness to act on a certain issue is mostly only carried for one's own surroundings. An aspect that can affect the motivation of urban residents to act on waste pollution, is that they "are likely to experience directly related key impacts and threats" (Frantzeskaki et al., 2016: 1). Through direct visibility as well as perceptibility of waste debris, since they are omnipresent in day life, the chances to motivate people are relatively high. In Jakarta, the low- to middle-income settlements are located along the coastline and rivers (Edelman & Gunawan, 2020: 61), therefore, they are already vulnerable to the impacts of climate change such as sea-level rise and flooding (Padawangi & Douglass, 2015). Since pollution through waste is interconnected to many issues in daily life, especially in these city districts, including being one of the causes of flooding as well as health and sanitation concerns (Lamond et al., 2012), one can argue that through showing the connection between their everyday problems and waste pollution, people's attention can be reached.

Additionally, the interviews reveal that although a legal framework for waste management is in place, as displayed above, there is a need to improve and strengthen the government engagement for SWM. The interview partners argued, the government doesn't "know about the implementation, what happens in the community" and "the challenge is more about the enforcement of the law, because law doesn't necessarily mean anything if the enforcement is not good. And […] [it] is about the issue of commitment of governments, especially local governments". Since in practice the provincial governments enforce the laws and regulations, it was emphasized that their commitment is crucial for SWM. Additionally, the civil society representatives said that there is no regulation that specifically ensures community participation and existing regulations do not mention "how to manage it or who should manage" the waste. This issue has also been elaborated by Akenji et al. (2020: 546), who discuss the various gaps of governmental engagement in Indonesia. The authors highlight the lack of capacities of the national and local governmental agencies dealing with waste management as well as the need for evidence-based policy (Akenji et al., 2020: 546).

A commonly perceived challenge in relation to participation is also the lack of awareness of the general problem regarding waste and littering. Therefore, the lack of awareness and commitment from local communities is mentioned several times as a hindering factor contributing to the mismanagement of materials and waste. This factor is often divided into two aspects along a socio-economic line. On the one hand, the socio-economically disadvantaged people encounter severe daily challenges. Therefore, they usually do not see the relevance of environmental issues for their daily struggles and do not have the energy and time to make efforts or the education to fully understand the problems. On the other hand, the middle- and high-income community groups are usually aware of the environmental problems,

but they seem to lack interest in making changes. One of the reasons described by an interviewee for that behavior is that wealthier communities have a waste management service, which is removing their waste for a fee. This usually means that people are not expected to sort their waste and it is not disposed of in a SWM system, but rather dumped in a landfill. These people regard waste management as a service that they pay for to avoid the unpleasant work of handling the waste and dealing with it in their neighborhood. A representative from an NGO elaborated regarding the issues of awareness and education in Jakarta that

> "although they are aware of waste or any other phenomenon that is caused by waste, for example the annual flood. […] But they don't know how to properly manage their waste […]. They […] don't know what the journey of the waste is to the processing side and so on and so forth. So, it's really important to have a very basic comprehension about waste and waste management for the residents of Jakarta."

To address the challenge of insufficient community participation in solid waste reduction, one approach can be to create incentives and disincentives, which can motivate people to manage their waste (Dickella Gamaralalage et al., 2021). An actor from a waste bank elaborated that governmental agencies, which are involved in SWM, could provide various (economic) incentives to encourage the people and avoid waste pollution. Once more, the role of the government within the waste management system is emphasized (Budihardjo et al., 2022) not only to provide suitable infrastructure and law enforcement but also "proper incentives to ensure efficiency and added value" (Marques et al., 2018: 292). In particular, a waste bank representative pointed out that such mechanisms can strengthen the continuity of community involvement in SWM activities. However, locally suitable incentives are still to be explored.

A critical and limiting factor for participatory approaches in SWM in Jakarta has been related to the engagement of the local leaders. A representative of an NGO argued that

> "they have an important role to play in addressing this issue because for example […] when we conduct [a] project, we need to ask the permission of the local leaders. Usually obtaining this permission from them can be quite a challenge because they themselves have their own idea about the waste conditions in their area and sometimes it's a challenge to convince them. So local leaders can be both a push and a pull factor."

Local leaders, be it the RTs/RWs, religious figures like the Imam of a local mosque or cultural figures are "very respected", as explained by an interviewee. Consequently, the involvement of such actors can also strengthen community participation and thereby present a 'hidden' or at least often unused potential.

Finally, community participation is imperative to reduce the 'mountains of waste' and the intercorrelated problems for the environment and the people in Jakarta. Yet, it has become evident that participation can only be one part of the solution. Among others, it should be coupled with the provision of structures, an increased awareness, and enhancement of law enforcement.

18.6 Conclusion

Whether participation can contribute to waste management seems to be a simple question for the civil society actors. They acknowledge participation to be important to achieve a sustainable SWM. However, different types of approaches, depending on the circumstances, actors, and purpose should be implemented. The ambiguous term of participation is perceived by most of the civil society actors as the involvement and contribution to a certain project or activity. Reviewing the uses to which participatory approaches have been put, whether for empowerment, activation of local communities, awareness for the problem at hand or to achieve project objectives, it is clear that participation is not the panacea for sustainable waste management. This study displays some of the obstacles and limitations, ranging from a deficiency of infrastructure for SWM to lack of government engagement and general awareness, which can be linked to socio-economic issues. These overarching challenges reveal that to holistically approach SWM, participatory formats should be combined among others with suitable structures and balanced engagement of all relevant actors. Notably, the engagement of governmental agencies, through effective law enforcement, awareness raising, and provision of suitable infrastructure as well as further incentives, proves to be essential for sustainable SWM. Additionally, through the possibly hidden potentials of local leaders in Jakarta to promote community participation, it has also become evident that there is a need to understand and incorporate local dynamics.

This explorative research offers an impulse for a deeper analysis of participatory approaches that address waste pollution. Many questions are still open, ranging from the empirical evidence for the effectiveness of participation for efforts addressing environmental pollution to the evaluation that includes further relevant actors.

The issue of waste and its impacts prove to be a complex and multi-layered global problem. Cities such as Jakarta are facing massive waste pollution. Participatory formats, such as those applied by the civil society organizations in Jakarta, can and should be a starting point of a comprehensive approach to address SWM in cities of the Global South.

Annex: Guideline for Semi-structured Interviews

Participative Solutions for Sustainable Waste Management in Jakarta

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Question Guideline

About the Organisation/Actor

1. What do you think are the major environmental challenges in Jakarta?
2. Could you tell me something about the organisation you are working in?
3. What is your role in the organisation?

Understanding

4. What does participation mean for you?
5. What does 'sustainability'/'sustainable development' mean for you?
6. From your perspective, what role does community participation play to achieve sustainable waste management?

The participative Process

7. What strategies and activities is your organisation implementing to address (sustainable) waste management in Jakarta?
8. Who is participating in your projects?
9. Which challenges have you been facing to involve different civil society groups (e.g., citizens, industry, ….)?
10. How does participation contribute to sustainable waste management in Jakarta?
11. What kind of legal regulations are in place to ensure community participation in planning processes?
12. If you were a policymaker at DKI Jakarta, what improvements would you make for sustainable waste management?

Thank you for your participation.

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References

Akenji, L., Bengtsson, M., Hotta, Y., Kato, M., & Hengesbaugh, M. (2020). Policy responses to plastic pollution in Asia: Summary of a regional gap analysis. In T. M. Letcher (Ed.), *Plastic waste and recycling* (pp. 531–567). Academic Press. https://doi.org/10.1016/B978-0-12-817880-5.00021-9

Antlöv, H., Brinkerhoff, D. W., & Rapp, E. (2010). Civil society capacity building for democratic reform: Experience and lessons from Indonesia. *Voluntas: International Journal of Voluntary and Nonprofit Organizations, 21*(3), 417–439. https://doi.org/10.1007/s11266-010-9140-x

Aprilia, A., Tezuka, T., & Spaargaren, G. (2012). Household solid waste management in Jakarta, Indonesia: A socio-economic evaluation. In: Rebellon, L. F. M. (Ed.). *Waste management – An integrated vision* (pp 71-100). INTECH. https://www.intechopen.com/chapters/40536

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224. https://doi.org/10.1080/01944366908977225

Baldwin, A. K., Corsi, S. R., & Mason, S. A. (2016). Plastic debris in 29 Great Lakes tributaries: Relations to watershed attributes and hydrology. *Environmental Science & Technology, 50*(19), 10377–10385. https://doi.org/10.1021/acs.est.6b02917

Bora, A. (1994). Grenzen der Partizipation? Risikoentscheidungen und Öffentlichkeitsbeteiligung im Recht. *Zeitschrift für Rechtssoziologie, 15*(2), 126–152. https://doi.org/10.1515/zfrs-1994-0202

Budihardjo, M. A., Ardiansyah, S. Y., & Ramadan, B. S. (2022). Community-driven material recovery facility (CdMRF) for sustainable economic incentives of waste management: Evidence from Semarang City, Indonesia. *Habitat International, 119*, 102488. https://doi.org/10.1016/j.habitatint.2021.102488

Cabannes, Y., Douglass, M., & Padawangi, R (2018). Cities by and for the people. *Cities in Asia by and for the people* (pp. 13–40). Amsterdam University Press. https://doi.org/10.5117/9789462985223

Carr, L. T. (1994). The strengths and weaknesses of quantitative and qualitative research: What method for nursing? *Journal of Advanced Nursing, 20*(4), 716–721. https://doi.org/10.1046/j.1365-2648.1994.20040716.x

Cornwall, A. (2008). Unpacking 'participation': Models, meanings and practices. *Community Development Journal, 43*(3), 269–283. https://doi.org/10.1093/cdj/bsn010

Court, J., Mendizabal, E., Osborne, D., & Young, J. (2006). *Policy engagement: How civil society can be more effective*. *Overseas Development Institute*.

Cox, E., & Johnson, V. (2010). Decarbonizing local economies: A new low carbon, high well-being model of local economic development. In M. Peters, S. Fudge, & T. Jackson (Eds.), *Low carbon communities: Imaginative approaches to combating climate change locally* (pp. 123–136). Edward Elgar Publishing.

Crowe, P. R., Foley, K., & Collier, M. J. (2016). Operationalizing urban resilience through a framework for adaptive co-management and design: Five experiments in urban planning practice and policy. *Environmental Science & Policy, 62*, 112–119. https://doi.org/10.1016/j.envsci.2016.04.007

Crutzen, P. J. (2006). The "anthropocene". In E. Ehlers & T. Krafft (Eds.), *Earth system science in the anthropocene* (pp. 13–18). Springer. https://doi.org/10.1007/3-540-26590-2_3

Damanhuri, E., Handoko, W., & Padmi, T. (2014). Municipal solid waste management in Indonesia. In *Municipal solid waste management in Asia and the Pacific Islands* (pp. 139–155). Springer.

Dethier, J. J. (2017). *Trash, cities, and politics: Urban environmental problems in Indonesia* (pp. 73–90). Cornell University Press. https://doi.org/10.5728/indonesia.103.0073

Dhokhikah, Y., & Trihadiningrum, Y. (2012). Solid waste management in Asian developing countries: Challenges and opportunities. *Journal of Applied Environmental and Biological Sciences, 2*(7), 329–335. Retrieved November 28, 2021, from https://www.scirp.org/(S(351jmbntvnsjt1aadkozje))/reference/referencespapers.aspx?referenceid=2829268

Dhokhikah, Y., Trihadiningrum, Y., & Sunaryo, S. (2015). Community participation in household solid waste reduction in Surabaya, Indonesia. *Resources, Conservation and Recycling, 102*, 153–162. https://doi.org/10.1016/j.resconrec.2015.06.013

Díaz-Reviriego, I., Turnhout, E., & Beck, S. (2019). Participation and inclusiveness in the intergovernmental science–policy platform on biodiversity and ecosystem services. *Nature Sustainability, 2*(6), 457–464. https://doi.org/10.1038/s41893-019-0290

Dickella Gamaralalage, P. J., Ghosh, S. K., & Onogawa, K. (2021). Source separation in municipal solid waste management: Practical means to its success in Asian cities. *Waste Management & Research*. https://doi.org/10.1177/0734242X211049606

Edelman, D. J., & Gunawan, D. S. (2020). Managing the urban environment of Jakarta, Indonesia. *Current Urban Studies, 8*(1), 57–106. https://doi.org/10.4236/cus.2020.81003

Foo, K. (2018). Examining the role of NGOs in urban environmental governance. *Cities, 77*, 67–72. https://doi.org/10.1016/j.cities.2018.01.002

Frantzeskaki, N., Kabisch, N., & McPhearson, T. (2016). Advancing urban environmental governance: Understanding theories, practices and processes shaping urban sustainability and resilience. *Environmental Science & Policy, 62*, 1–6. https://doi.org/10.1016/j.envsci.2016.05.008

Gaber, J. (2019). Building "a ladder of citizen participation" Sherry Arnstein, citizen participation, and model cities. *Journal of the American Planning Association, 85*(3), 188–201. https://doi.org/10.1080/01944363.2019.1612267

Gemmill, B., & Bamidele-Izu, A. (2002). The role of NGOs and civil society in global environmental governance. In D. C. Esty & M. H. Ivanova (Eds.), *Global environmental governance: Options and opportunities* (Vol. 8, pp. 77–100). Forestry & Environmental Studies Publications Series. Retrieved November 28, 2021, from https://elischolar.library.yale.edu/cgi/viewcontent.cgi?article=1003&context=fes-pubs#page=77

Gray, L. M., Wong-Wylie, G., Rempel, G. R., & Cook, K. (2020). Expanding qualitative research interviewing strategies: Zoom video communications. *The Qualitative Report, 25*(5), 1292–1301. Retrieved November 28, 2021, from https://www.proquest.com/docview/2405672296/fulltext/586B52FD308641A2PQ/1?accountid=13621

Greven, M. T. (2009). *Die politische Gesellschaft: Kontingenz und Dezision als Probleme des Regierens und der Demokratie* (2nd ed.). VS Verlag.

Habermas, J. (1981). *Theorie des kommunikativen Handelns, Frankfurt am Main*. Suhrkamp.

Hoornweg, D., & Bhada-Tata, P. (2012). *What a waste: A global review of solid waste management*. World Bank. http://hdl.handle.net/10986/17388

Ida, R., Saud, M., & Mashud, M. (2020). An empirical analysis of social media usage, political learning and participation among youth: A comparative study of Indonesia and Pakistan. *Quality & Quantity, 54*, 1285–1297. https://doi.org/10.1007/s11135-020-00985-9

Irvin, R. A., & Stansbury, J. (2004). Citizen participation in decision making: is it worth the effort?. *Public administration review, 64*(1), 55–65. https://doi.org/10.1111/j.1540-6210.2004.00346.x

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science, 347*(6223), 768–771. https://doi.org/10.1126/science.1260352

Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. World Bank Publications.

Kim, D., & Lim, U. (2017). Social enterprise as a catalyst for sustainable local and regional development. *Sustainability, 9*(8), 1427. https://doi.org/10.3390/su9081427

Krüger, T. (2021). Energiekonflikte und Demokratiekrise. Eine radikaldemokratische Perspektive auf das Ringen um Gemeinwohlziele der Energiewende. *Zeitschrift für Politikwissenschaft*, 1–25. https://doi.org/10.1007/s41358-021-00289-w

Kuckartz, U. (2018). *Qualitative Inhaltsanalyse. Methoden, Praxis, Computerunterstützung*. Weinheim.

Lamond, J., Bhattacharya, N., & Bloch, R. (2012). The role of solid waste management as a response to urban flood risk in developing countries, a case study analysis. *WIT Transactions on Ecology and the Environment, 159*, 193–204. https://doi.org/10.2495/FRIAR120161

Lavigne, F., Wassmer, P., Gomez, C., Davies, T. A., Hadmoko, D. S., Iskandarsyah, T. Y. W., et al. (2014). The 21 February 2005, catastrophic waste avalanche at Leuwigajah dumpsite, Bandung, Indonesia. *Geoenvironmental Disasters, 1*(1), 1–12. https://doi.org/10.1186/s40677-014-0010-5

Laville, J. L., Young, D. R., & Eynaud, P. (Eds.). (2015). *Introduction. Civil society, the third sector and social enterprise: Governance and democracy*. Routledge.

Lawrence, R. L., & Deagen, D. A. (2001). Choosing public participation methods for natural resources: A context- specific guide. *Society and Natural Resources, 14*(9), 857–872. https://doi.org/10.1080/089419201753242779

Lemos, M. C., & Agrawal, A. (2006). Environmental governance. *Annual Review of Environment and Resources, 31*, 297–325. https://doi.org/10.1146/annurev.energy.31.042605.135621

Lestari, P., & Trihadiningrum, Y. (2019). The impact of improper solid waste management to plastic pollution in Indonesian coast and marine environment. *Marine Pollution Bulletin, 149*(110505), 1–9. https://doi.org/10.1016/j.marpolbul.2019.110505

Maalouf, A., Mavropoulos, A., & El-Fadel, M. (2020). Global municipal solid waste infrastructure: Delivery and forecast of uncontrolled disposal. *Waste Management & Research, 38*(9), 1028–1036. https://doi.org/10.1177/0734242X20935170

Marques, R. C., Simões, P., & Pinto, F. S. (2018). Tariff regulation in the waste sector: An unavoidable future. *Waste Management, 78*, 292–300. https://doi.org/10.1016/j.wasman.2018.05.028

Martinez, R., & Masron, I. N. (2020). Jakarta: A city of cities. *Cities, 106*, 102868. https://doi.org/10.1016/j.cities.2020.102868

Mayring, P. (2014). *Qualitative content analysis: Theoretical foundation, basic procedures and software solution*. Klagenfurt.

Michelsen, D., & Walter, F. (2013). *Unpolitische Demokratie: Zur Krise der Repräsentation*. Suhrkamp.

Myllylä, S. (2001). NGOs in urban environmental governance: Waste recycling in Cairo. In A. Tostensen, I. Tvedten, & V. Mariken (Eds.), *Associational life in African cities: Popular responses to the urban crisis* (pp. 198–217).

Nascimento, L. D. S., & Salazar, V. S. (2020). On social enterprises and social entrepreneurship: An extension. *BAR-Brazilian Administration Review, 17*(2). https://doi.org/10.1590/1807-7692bar2020190014

Newig, J., & Kvarda, E. (2012). Participation in environmental governance: Legitimate and effective? In *Environmental Governance*. Edward Elgar Publishing.

Onyanta, A. (2016). Cities, municipal solid waste management, and climate change: Perspectives from the South. *Geography Compass, 10*(12), 499–513. https://doi.org/10.1111/gec3.12299

Padawangi, R. (2014). Reform, resistance and empowerment: Constructing the public city from the grassroots in Jakarta, Indonesia. *International Development Planning Review, 36*(1), 33–51. https://doi.org/10.3828/idpr.2014.3

Padawangi, R., & Douglass, M. (2015). Water, water everywhere: Toward participatory solutions to chronic urban flooding in Jakarta. *Pacific Affairs, 88*(3), 517–550. https://doi.org/10.5509/2015883517

Parfitt, T. (2004). The ambiguity of participation: A qualified defence of participatory development. *Third World Quarterly, 25*(3), 537–555. https://doi.org/10.1080/0143659042000191429

Pellizzoni, L. (2003). Uncertainty and participatory democracy. *Environmental Values, 12*(2), 195–224. https://doi.org/10.3197/096327103129341298

Pomponi, F., & Moncaster, A. (2016). Circular economy for the built environment: A research framework. *Journal of Cleaner Production, 143*, 710–718. https://doi.org/10.1016/j.jclepro.2016.12.055

Prendeville, S., Cherim, E., & Bocken, N. (2018). Circular cities: Mapping six cities in transition. *Environmental Innovation and Societal Transitions, 26*, 171–194. https://doi.org/10.1016/j.eist.2017.03.002

Pretty, J. N. (1995). Participatory learning for sustainable agriculture. *World Development, 23*(8), 1247–1263. https://doi.org/10.1016/0305-750X(95)00046-F

Prieto-Sandoval, V., Jaca, C., & Ormazabal, M. (2018). Towards a consensus on the circular economy. *Journal of Cleaner Production, 179*, 605–615. https://doi.org/10.1016/j.jclepro.2017.12.224
Putri, A. R., Fujimori, T., & Takaoka, M. (2018). Plastic waste management in Jakarta, Indonesia: Evaluation of material flow and recycling scheme. *Journal of Material Cycles and Waste Management, 20*(4), 2140–2149. https://doi.org/10.1007/s10163-018-0753-2
Rahmasary, A. N., Koop, S. H., & van Leeuwen, C. J. (2021). Assessing Bandung's governance challenges of water, waste, and climate change: Lessons from urban Indonesia. *Integrated Environmental Assessment and Management, 17*(2), 434–444. https://doi.org/10.1002/ieam.4334
Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. *Biological Conservation, 141*(10), 2417–2431. https://doi.org/10.1016/j.biocon.2008.07.014. Retrieved November 28, 2021, from https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/84427/93862/F1909905714/IDN84427.pdf
Richards, C., Blackstock, K. L., & Carter, C. E. (2004). *Practical approaches to participation*. SERG Policy Brief No. 1. Macauley Land Use Research Institute. Retrieved November 28, 2021, from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.605.4495&rep=rep1&type=pdf
Rifkin, S. B., & Kangere, M. (2002). *What is participation* (pp. 37–49). Community-based rehabilitation (CBR) as a participatory strategy in Africa.
Salim, W., & Hudalah, D. (2020). Urban governance challenges and reforms in Indonesia: Towards a new urban agenda. In B. Dahiya & A. Das (Eds.), *New urban agenda in Asia-Pacific – Governance for sustainable and inclusive cities* (pp. 163–184). Springer. https://doi.org/10.1007/978-981-13-6709-0_6
Schreier, M. (2014). Qualitative content analysis. In U. Flick (Ed.), *The SAGE handbook of qualitative data analysis* (pp. 170–183). Sage.
Seelos, C., & Mair, J. (2005). *Sustainable development: How social entrepreneurs make it happen*. Working Paper, 611, IESE Business School – University of Navarra. https://doi.org/10.2139/ssrn.876404
Shahreza, M., Sarwoprasodjo, S., Arifin, H. S., & Hapsari, D. R. (2020). Analysis of the convergence communication model on waste Bank program stakeholders in South Tangerang City, Indonesia. *Nyimak: Journal of Communication, 4*(2), 249–265.
Shekdar, A. V. (2009). Sustainable solid waste management: An integrated approach for Asian countries. *Waste Management, 29*(4), 1438–1448. https://doi.org/10.1016/j.wasman.2008.08.025
Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science, 347*(6223). https://doi.org/10.1126/science.1259855
Steffen, W., Crutzen, P. J., & McNeill, J. R. (2016). The Anthropocene: Are humans now overwhelming the great forces of nature? In R. E. Dunn, L. J. Mitchell, & K. Ward (Eds.), *The new world history* (pp. 440–459). University of California Press. https://doi.org/10.1525/9780520964297-051
Stratan, D. (2017). Success factors of sustainable social enterprises through circular economy perspective. *Visegrad Journal on Bioeconomy and Sustainable Development, 6*(1), 17–23. https://doi.org/10.1515/vjbsd-2017-0003
Thompson, R. C., Olsen, Y., Mitchell, R. P., Davis, A., Rowland, S. J., John, A. W., McGonigle, D., & Russell, A. E. (2004). Lost at sea: Where is all the plastic? *Science, 304*(5672), 838–838. https://doi.org/10.1126/science.1094559
Turnhout, E., Van Bommel, S., & Aarts, N. (2010). How participation creates citizens: Participatory governance as performative practice. *Ecology and Society, 15*(4). https://www.jstor.org/stable/26268213

United Nations Department of Economic and Social Affairs (UN DESA). (2015). *World Urbanization Prospects: The 2014 Revision*. Final Report (ST/ESA/SER.A/366).

Wijayanti, D. R., & Suryani, S. (2015). Waste bank as community-based environmental governance: A lesson learned from Surabaya. *Procedia-Social and Behavioral Sciences, 184*, 171–179. https://doi.org/10.1016/j.sbspro.2015.05.077

Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU). (2011). *Welt im Wandel: Gesellschaftsvertrag für eine Große transformation* (2nd ed.). WBGU. Retrieved November 28, 2021, from https://www.wbgu.de/fileadmin/user_upload/wbgu/publikationen/hauptgutachten/hg2011/pdf/wbgu_jg2011.pdf

Yang, H., Ma, M., Thompson, J. R., & Flower, R. J. (2018). Waste management, informal recycling, environmental pollution and public health. *Journal of Epidemiology and Community Health, 72*(3), 237–243. https://doi.org/10.1136/jech-2016-208597

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Part V
Climate

Chapter 19
Should Climate Actions Stay Amidst the Covid-19 Pandemic? A Crisis Management Governance Perspective

Nur Firdaus and Atika Zahra Rahmayanti

Abstract It has been more than 5 years since the Paris Agreement was ratified, while the progress to limit the increase in global temperature to well below 2 °C above preindustrial levels is questionable. Addressing climate change cannot be separated from economic and political issues, leading to an emergence of global discourses about the appropriate means for a sustainable transformation. Although the green economy has received criticisms, such a concept is a "popular" vision to balance economic, social well-being, and ecological goals. However, the Covid-19 pandemic, which has no clear ending period, significantly impacts the economy and threatens climate actions. This chapter aims to analyze the fate of climate actions in Indonesia. We employ a crisis management framework to provide insights about governing climate change under the Covid-19 pandemic while seizing the opportunities to achieve the climate target. Unlike previous crises, the Covid-19 pandemic should be treated differently in which the government needs to identify the big picture of the problem. In this regard, the role of leadership played by the President is critical to determine what actions can be possibly taken and measure the potential impacts of delaying the actions. As a result, creative and strategic steps are necessary, aligning with the recovery policies. In terms of potential opportunities, promoting a circular economy would accelerate the government's commitment to low-carbon development. Moreover, optimizing blended finance to mobilize public and philanthropic funds can support green movements, aligning with the proliferation of green financial markets. Thus, the Covid-19 crisis has become a moment to

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seize the opportunity for redesigning climate policies, including financing mechanisms and improving the governance in climate adaptation and mitigation.

Keywords Climate change · Covid-19 · Crisis management · Governance · Climate policy

19.1 Introduction

It has been more than 5 years since the Paris Agreement (COP21) entered into force, while the progress made by 184 countries ratifying to limit the increase in global temperature to well below 2 °C above preindustrial levels is still questionable. Watson et al. (2019) find that almost 75% of the 184 climate pledges are partially or even totally insufficient to contribute to reducing emissions by 2030, and some of these pledges could not be achieved. Similarly, it is predicted that some countries will not reach their goals, and some of the world's largest emission contributors will continue to increase their emissions (Leahy, 2019). However, global renewable energy capacity grew significantly by 50.39% from 2013 to 2018 (IRENA, 2019), and its supplies are estimated to expand by 50% in the next 5 years, driven by a resurgence in solar energy (Ambrose, 2019), showing a strong decarbonization commitment.

Tackling climate change cannot be separated from economic and political issues. This has led to an emergence of global discourses about the appropriate means for a sustainable transformation. In other words, there is a need to design an ideal condition to achieve economic growth, improve human well-being, and reduce environmental risks at the same time. The concept of "green economy" or "green growth," a vision initiated by (UNEP, 2009), is a much-discussed topic among scholars seeking to accommodate both economic growth and ecological sustainability; the concept, however, receives critics as well (Death, 2015). The green economy seems radical and utopian, legitimating new forms of capitalism," green capitalism," and maintaining capitalist hegemony (Brockington, 2012; Tienhaara, 2014; Wanner, 2015). Further, Hickel and Kallis (2019) find no substantial evidence that decoupling from carbon emissions could be achieved, so green growth is likely to be a misguided paradigm.

Aside from criticisms, the green economy is a "popular" vision adopted by many countries as a basis for balancing economic, social well-being, and ecological goals. Along with the implementation, however, the Covid-19 pandemic has hampered the green economy vision. Moreover, natural resources exploitation is arguably needed to recover, leading to a higher probability of environmental degradation.

On the other hand, a question related to environmental improvement has raised whether the Covid-19 pandemic causes emissions reduction. Carbon Brief finds that CO_2 emissions decreased by 25% over 4 weeks in China; unfortunately, this

reduction was temporary as coal consumption at six major power firms in China started to increase with economic recovery (Myllyvirta, 2020). Similarly, there has been a short-term improvement in air quality, but the gain would not last in the long term (The Economist, 2020).

The economic recovery after Covid-19 could lead to a new economic perspective as this pandemic has changed global discourses on how countries refocus on economic growth and address environmental protection. Stiglitz calls the world for a green economy to help the economy out of its Covid-19 torpor (Environmental Finance, 2020). This signifies the world entering a "new-normal" situation and restarting the economy by emphasizing sustainability. Nevertheless, the Covid-19 pandemic is a disaster, especially for developing economies with limited financial and medical resources (Goldin, 2020; UNDP, 2020). Although they are less forced to fight against climate change but more vulnerable to its impact, the Covid-19 also threatens their plans to take climate actions. This problem brings about how they will keep committing to their climate pledges, while access to finance becomes more challenging (Dagnet et al., 2020) as most resources are reallocated to the Covid-19 pandemic. As a result, developing countries seem to have "double burdens" to overcome the pandemic and finance their low-carbon transition process. On the other hand, the UN Secretary-General, António Guterres, said, "*We cannot allow the heavy and rising debt burden of developing countries to serve as a barrier to their ambition [on the climate]*" (Guterres, 2020). Therefore, all countries need to sustain climate actions amid this pandemic.

Against this backdrop, we analyze the fate of climate actions in one of the developing countries, Indonesia, considered one of the world's largest emitters. Although the Government of Indonesia (GOI) has set the NDC target to reduce 29% of GHG emissions below BAU emissions by 2030 and a conditional target of up to 41% reductions with international supports, Climate Action Tracker (2019) assesses the target as highly insufficient and seems ambitious. Nevertheless, it is achievable, requiring an acceleration in renewable energy development, and its obstacles need to be addressed. Another challenge is that GOI needs to secure at least 23,000 MW to meet the national electricity needs by 2025. To this, Indonesia races against time toward a low carbon transition in the energy supply. There is no question that the Covid-19 pandemic has dragged into recession, resulting in the state budget reallocation to overcome this problem.

Thus, our questions are (i) whether climate actions should stay amidst the Covid-19 pandemic and (ii) how to effectively manage and leverage climate actions with potential and available resources to achieve the NDC target. These questions are critical, mainly for policymakers to make strategic institutional decisions in a turbulent environment. This study is qualitative research, using a crisis management framework to provide insights about governing climate change under the Covid-19 pandemic while seizing the opportunities to achieve the climate target. Data were obtained mainly from government reports and statements, news, and other related documents and literature.

This chapter proceeds as follows. Section 19.2 presents crisis management and governance theory as the basis for our analysis. Section 19.3 demonstrates

Indonesia's commitment to climate change, including progress and further actions. We elaborate on stakeholders' roles related to climate actions in Sect. 19.4. Section 19.5 discusses sustaining climate actions under the Covid-19 storm. Section 19.6 is the conclusion.

19.2 Crisis Management Governance

In the era of VUCA, organizations are required to be agile to get through every unfavorable situation. In this regard, organizations should react, control, and fix such a situation immediately to minimize potential losses and become resilient. Also, seizing opportunities is considerable for improvement as the unfavorable situation will transform into opportunities for future capital accumulation (Farazmand, 2014). Moreover, unpredictable events, such as crises, are viewed as external forces; thus, a direct and identifiable response is required (Gilpin & Murphy, 2008). Thus, crisis management is needed to make organizations survive.

Pearson and Mitroff (1993) propose four crisis management variables: types of crises, crisis phases, systems (causes), and stakeholders. In relation to this, Pearson and Clair (1998) identify factors contributing to the degree of organizational success or failure from the crisis, such as executive perceptions about risk, environmental context, adoption of organizational crisis management preparations, triggering events, and cognitive, emotional, and behavioral responses. Farazmand (2014) suggests four variables related to crisis management: mitigation, preparedness, response, and recovery. These factors will determine whether the success outcome outweighs the failure outcome. However, Gilpin and Murphy (2008) point out that successful crisis management is not determined by scientific planning and prescriptive decision making; instead, the nature of the organization, the crisis, and the environment are factors influencing the outcomes. Also, aspects, such as structural or organizational features, actor constellations and strategies, administrative characteristics in combination with cultures, are the key to understanding the process and performance of crisis governance (Andrews, 2013; Kuhlmann et al., 2021).

Analyzing crisis using a crisis management perspective has been practiced at any level of organizations. At a country level, crisis management plays a prominent role in determining survival during the crisis. Boin et al. (2005) state that cooperation among countries and strong leadership are critical. In public organizations, leadership, supported by a robust institutional framework, has played a crucial role in crisis management as citizens expect their policymakers to avert the threats or minimize the risks (Boin et al., 2005). This emphasizes the importance of leadership and stakeholder perceptions in the crisis management (Bundy et al., 2017). Besides, Kuhlmann et al. (2021) argue that crises provide an opportunity for political actors to show their leadership and effective governance; thus, they gain support from citizens or even win political competitions.

Crisis management is critical in directing the government to handle the Covid-19 pandemic effectively (Mizrahi et al., 2021). This requires good cooperation among

public officials, policymakers, and citizens to reduce risks and minimize costs for society (Mizrahi et al., 2021). In other words, the dialogue between the organization (policymakers) – a country, and its stakeholders – nongovernmental and multilateral agencies is essential during the policy-making process to deal with the crisis (Henderson, 2014; Oyama, 2010). In addition, power relations in governance configurations and regulatory strategies are needed to handle the Covid-19 situation (Lidskog et al., 2020). Hence, crisis management cannot be separated from governance in which power distribution, control, and coordination among entities within the government system are necessary.

Several variables are vital to crisis management governance, such as leadership and stakeholders' perception in which their interaction and dialogue lead to a solid institution and governance. However, this needs to consider the environmental context to identify and mitigate problems, causes, regulative issues, and impacts. In this case, an organization should be open-minded and risk-taking. As the crisis causes an effect, response analysis and creative and strategic thinking are required to design and implement coping strategies for recovery. Thus, organizations are encouraged to be responsive to any changes and have firm decisions and actions.

19.3 Indonesia's Commitment to Climate Change: Progress and Further Actions

Regarding climate actions, two challenging sectors to be addressed are AFOLU and energy. For AFOLU, one of the most significant contributors to emissions is forest fires caused by the massive land conversion. To address such an issue, GOI has implemented five priority policies: (i) combating illegal logging and forest fire, (ii) restructuring of industries engaged in the forestry sector, (iii) forest rehabilitation and conservation, (iv) promoting sustainable forest management, and (v) supporting local communities' economy (Fig. 19.1). Also, GOI has shown its commitment through REDD+ results-based payments, supported by a number of regulations in managing natural forests.

Based on KLHK's performance report, from 2010 to 2014, GHG emissions reduction is relatively significant, except in 2013 and 2014. However, in 2015, GHG emissions increased considerably, which exceeded the BAU level. GHG emissions dropped in 2017 and 2018 but jumped in 2019 (Fig. 19.2). The main factors contributing to emissions in the forest sector include changes in carbon stocks, peat decomposition, and peat fire. Dwisatrio et al. (2021) find that deforestation and forest degradation remain significant challenges and contribute to GHG emissions, particularly forest land-use change and peat fires (around 48% of the country's GHG emissions).

In terms of the energy transition, Indonesia has made relatively slow progress in renewable energy capacity compared to the other nine largest GHG emitters (Fig. 19.3). Besides, GOI is undeniably facing a significant challenge to a



Fig. 19.1 Climate mitigations per sector. (Source: Indonesia Second Biennial Update Report 2018)

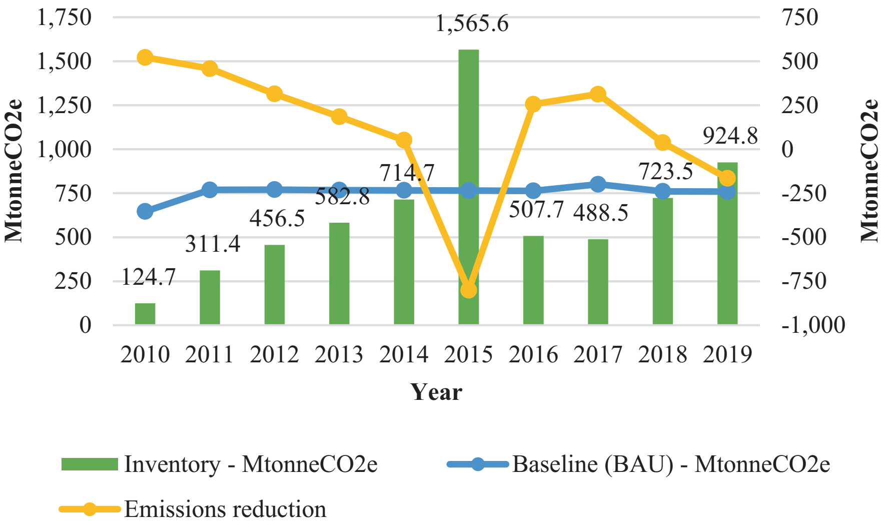


Fig. 19.2 GHG emissions reduction in the forest sector. (Source: KLHK, 2020)

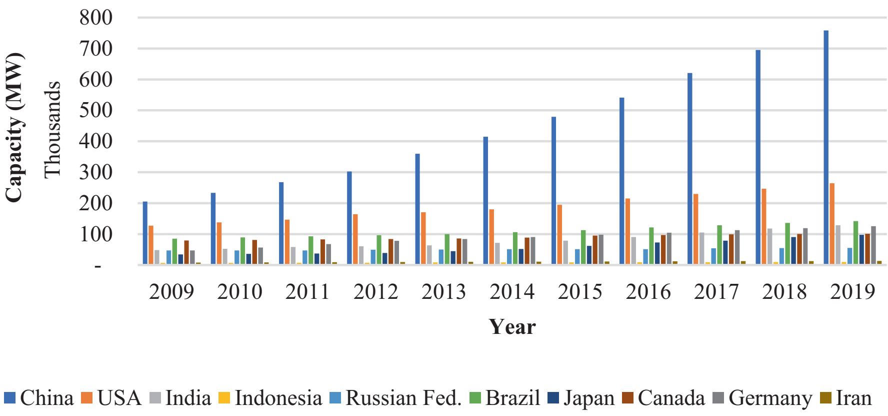


Fig. 19.3 Top 10 world emitters of GHG's total renewable energy capacity. (Source: IRENA, 2019, 2020)

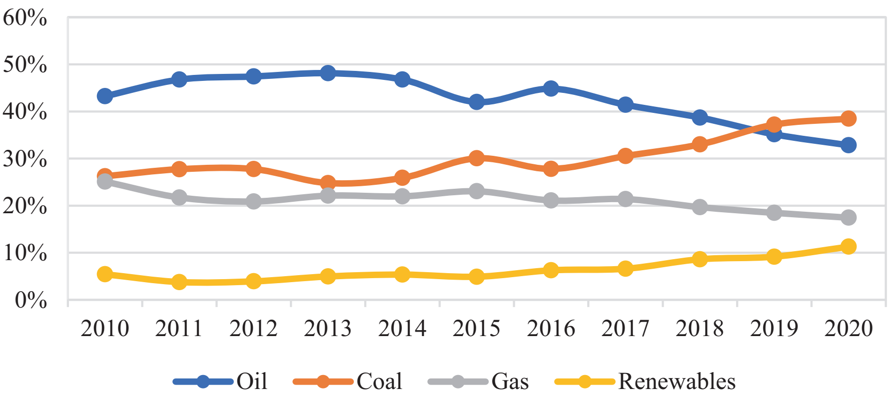


Fig. 19.4 Progress energy mix. (Source: MEMR, 2020)

low-carbon energy system considering a high reliance on fossil fuels and abundant coal resources (Fig. 19.4). In addition, the political economy contributes to the discourse of energy transition in which fossil fuel resources contribute to state revenues.

Furthermore, from all sectors, GHG emissions declined by 1.866 MtonneCO_2e (2.04% out of 16.28% target). However, this achievement was only 14.75% of the target. Figures 19.5 and 19.6 depict the National GHG inventory and its detailed emission reduction by sector in 2019. This performance has put Indonesia in the 24th position in the Climate Change Performance Index 2021 (KLHK, 2020).

Although climate actions show significant achievement, supportive policies with strong political commitment and appropriate institutional arrangements are required, particularly during the Covid-19 pandemic. GOI needs to realize that the NDC 2030 target is the near-term climate goal. Thus, immediate, rapid, and intensified climate

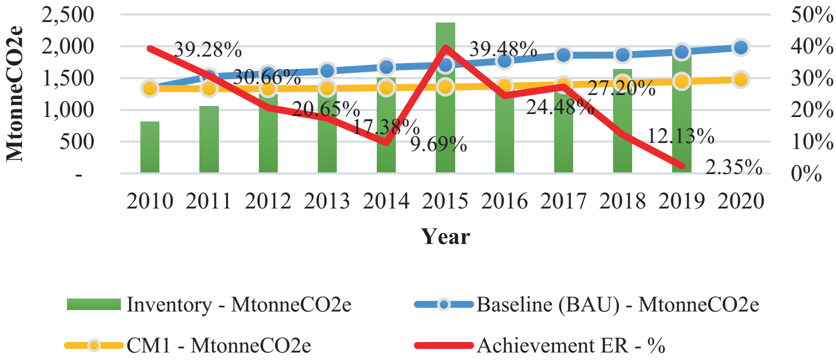
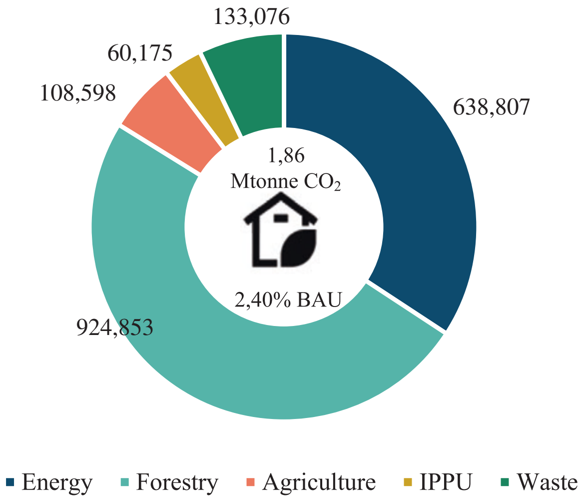


Fig. 19.5 Progress of climate actions – GHG emissions reduction. (Source: KLHK, 2020)

Fig. 19.6 Progress of climate actions – GHG emissions reduction in 2019 (tonne CO_2). (Source: KLHK, 2020)



actions are needed considering the progress made since the Paris Agreement entered into force. GOI's long-term strategies for low carbon and climate resilience 2050 (LS-LCCR 2050) provide a comprehensive approach to climate governance that can accelerate GHG emissions reduction (GOI, 2021). In this case, cross-cutting issues need integrated actions involving multiple sectors.

For further actions, GOI emphasizes the importance of strategic partnerships to not only support the transition to a low-carbon economy but also recover the economy from the Covid-19 adverse effects. However, it is worth noting that strategic partnerships should provide mutual benefits. The case of Norway, for instance, can be a lesson learned to improve climate governance. As stipulated in Article 6 of the Paris Agreement, strategic partnerships play a crucial role in achieving climate objectives through international collaborations (Mraz, 2021).

Last, as in the LS-LCCR 2050, GOI focuses on harmonizing mitigation and adaptation actions. For mitigation, sectors such as agriculture, forestry, energy, waste, and IPPU will be connected to adaptation aspects with several targets: (i) economic resilience, (ii) social resilience and livelihood, and (iii) resilience and landscape. These targets cover priority areas, including food, water, energy, health, ecosystem, and disaster. The detailed actions are provided in NAM-NAP. Since the FOLU and energy sectors are the primary sources of emissions, they have been targeted to achieve climate goals. To this, FOLU will become a net sink, and the energy system will be set to near zero in the long-term actions.

19.4 Stakeholders' Roles: Governance as Cross-Sector Collaboration

Undeniably, the Covid-19 pandemic attacking the world was unpredictable. While Indonesia had time on its hand, unfortunately, the spread of Covid-19 could not be anticipated due to the tendency to underestimate and be antiscientific. This denial made the government stutter in responding to Covid-19. As a result, the government was unprepared, leading to poor crisis management.

Although crisis management was not well-implemented at the beginning of the outbreak, the government's responses to encountering the impact of the Covid-19 pandemic were financially significant, resulting in a higher government budget deficit of around 6.34%. Also, the government has established a Covid-19 Task Force. However, the proposed national economic recovery policies limited addressing the issue of climate actions directly. Instead, the policies mainly focus on health, social protection, SMEs, the private sector, and government-related institutions.

Furthermore, along with implementing economic recovery policies, GOI shows its climate commitment by promoting "build back better," as echoed worldwide. But unfortunately, such a commitment seems unclear enough, mainly related to governance and stakeholders' roles. To this, the involvement of stakeholders in the policy-making process is critical to ensure that state and nonstate actors (e.g. businesses, NGOs, CSOs, and community) can take steps proportionately and feel more engaged and responsible for achieving the NDC target. In this regard, their actions should be aligned with the economic recovery process.

A lesson from the Covid-19 pandemic, Ahmad (2020) argues that catastrophic outcomes may occur if there is a lack of coordinated actions among government actors and financing. Admittedly, the Covid-19 pandemic is a multidimensional issue that connects human health and environmental systems, so it is necessary to build a resilient world under shared governance in addressing such problems (Jowell & Barry, 2020). In other words, working together to overcome the Covid-19 pandemic and staying actions toward climate change is needed in helping the government to lessen the burden. Ruiu (2020) suggests the need for multilevel collaboration that aligns collective and individual actions for Covid-19 and climate change. In relation

to this, there is no single monocentric global governance arrangement in climate change, in which a single, hierarchical unit structures the activities of all other units (van Asselt & Zelli, 2018). In this regard, a polycentric governance approach (see Jordan et al., 2018a) that emphasizes collaborative partnerships among government, private sectors, NGOs, CSOs, international cooperation agencies, and academics has played a critical role in the national response to climate change.

GOI has released NAM-NAP and several prioritized strategies on climate change management, which set out mandatory to specific line ministries to be responsible in the domain sector and provide a policy mechanism to facilitate coordination among all stakeholders. Each actor can contribute to managing climate change through their interests and roles. For instance, the private sector is a key to scale up investment and encourage innovation in a green project. In addition, a corporate social responsibility program can be used to boost local people's awareness, drive action, and offer positive environmental effects. Engagement of nonstate parties such as NGOs and CSOs have a pivotal role in facilitating society's needs and decreasing climate risk vulnerability at the grassroots level. In this case, society needs to know the benefits of taking actions on climate change as they fight for the Covid-19 pandemic (see Howarth et al., 2020). In the global scope, multilateral agencies assist in reaching NDC goals through their best practice programs and financial aid to make contributions effective (see Andonova et al., 2018; Jordan et al., 2018b; Mraz, 2021). For coordination and building synergy among actors, governance has primary authority to enhance engagement in climate resilience. Therefore, partnerships across diverse actors are the key in delivering climate actions in targeted sectors (forestry, agriculture, energy, waste management, and IPPU) (Fig. 19.7).

The implementation of climate action and policies needs intense coordination across stakeholder authorities. Unfortunately, the issue of coordination is one of the main challenges in the planning and execution in Indonesia, the more so if linked to the political structure and decentralized governance system (Bappenas, 2012). On the other hand, climate change management still faces sectoral egoism and uneven distribution of information. For instance, in the REDD++ program, forest management is within the jurisdiction of KLHK, while deforestation cases are often related to other ministries. Such a problem reflects the ineffectiveness of cross-sectoral coordination structures and institutions in coping with deforestation (Indrarto et al., 2012). In other words, GOI's commitments remain weak as there are a number of contradictory regulations and poor coordination among government agencies (Dwisatrio et al., 2021). In relation to this, a well-governance should be implemented by emphasizing the principles of inclusiveness, transparency, easy access to information and accountability with solid coordination (Bappenas, 2019). Therefore, the need for leadership played by the President is pivotal to direct stakeholders' roles so that Indonesia can pursue sustainability and economic development simultaneously.

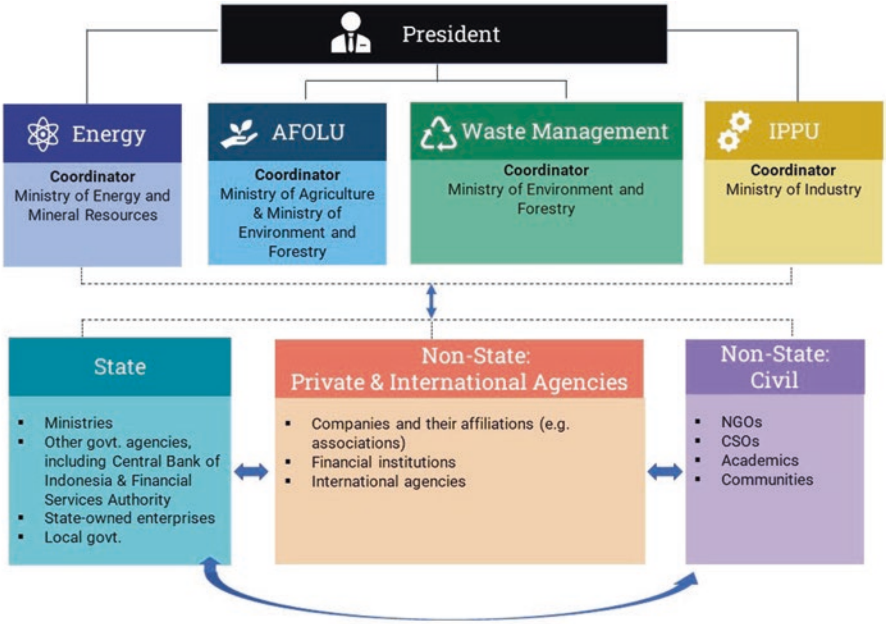


Fig. 19.7 Stakeholders' mapping. (Source: Modified by Author(s) from Indonesia Biennial Update Report 2018)

19.5 Discussion: Sustaining Climate Actions Under the Covid-19 Storms

19.5.1 Managing Climate Actions: An Evaluation Towards the Paris Target

The Covid-19 pandemic remains a significant challenge, affecting the health system and the economy. Still, climate change requires consistent and strong commitment, considering the near-term target in 2030. GOI has designed a set of strategies to build a strong foundation related to governing climate change actions with a supportive policy framework. As a result, various breakthroughs have been implemented to ensure actions align with the NDC target, such as establishing ICCTF, increasing the budget for climate change goals, and enabling environment and comprehensive fiscal framework (Fig. 19.8).

GOI has taken progressive steps to reform the budgeting management system and increase investments to support RAN GRK. In 2009, ICCTF was established to catalyze and mobilize funding sources for climate mitigation and adaptation programs. As an innovation fund, ICCTF has been an alternative funding mechanism to

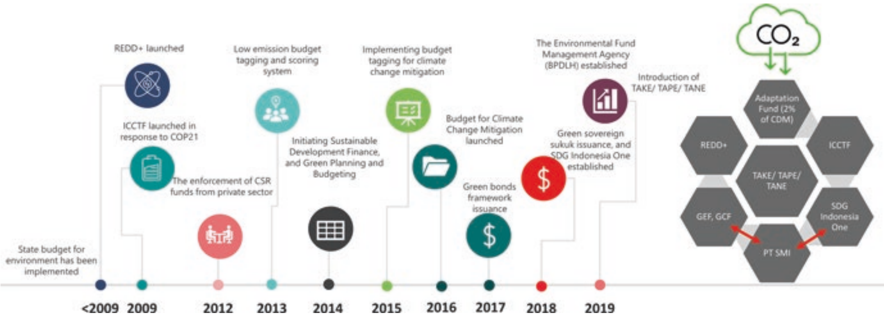


Fig. 19.8 Breakthroughs done by GOI to address climate change. (Source: Author(s))
Notes: The green projects funded by Green Sukuk are selected from tagged projects that fall into one of the nine Eligible Green Sectors under the framework; The Green Sukuk proceeds are used for both financing and refinancing Eligible Green Projects

blend international and domestic funds to invest in vulnerable sectors and high-risk areas. With a robust approach to multistakeholder's decision-making, this fund provides opportunities for strengthening collaboration across donors and key stakeholders (Halimanjaya et al., 2014). As a result, ICCTF successfully collected USD 3.621 million, consisting of a state budget (15%) and multilateral donors (e.g., Asian Development Bank and World Bank) (85%) in 2021 (ICCTF, 2021).

Further, ICCTF funded several programs that are part of the COREMAP – CTI World Bank and COREMAP – CTI Asian Development Bank grant projects. The activities include constructing a monitoring tower infrastructure, eco-tourism information center, and compiling "A Blue Finance Policy Note: Financing options for small-medium fisheries enterprise and marine conservation in Indonesia," part of a collaboration with KKP. In addition, ICCTF has shown that climate change can push Indonesian development practices to adopt new approaches (Halimanjaya et al., 2014). Last, ICCTF has effectively managed and allocated existing funding; it has managed to modestly utilize limited funding available to implement adaptation programs in line with national policy pathways and with the excellent representation of stakeholders (Sheriffdeen et al., 2020).

Another significant progress in strengthening climate budgeting management is CBT to evaluate public expenditure by tracking funds and enhancing effectiveness allocations to reach NDC's targets since 2016. This scheme integrates ministries, agencies, and local governments' planning, monitoring, reporting, and evaluation systems. Figure 19.9 shows the process of budget tagging that follows the government's planning and budgeting cycle. Under this process, ministries and institutions collect work plans containing the program, output, and budgeting related to climate change through planning and budgeting system (ADIK and KRISNA applications). Ministries and institutions can perform self-assessment on mitigation, adaptation, and cobenefit output by referring to the national policies strategies of climate change (RAN GRK, RAN API, NDC). The MoF, Bappenas, and KLHK will review the output to ensure the budget for addressing climate change. This step aims to

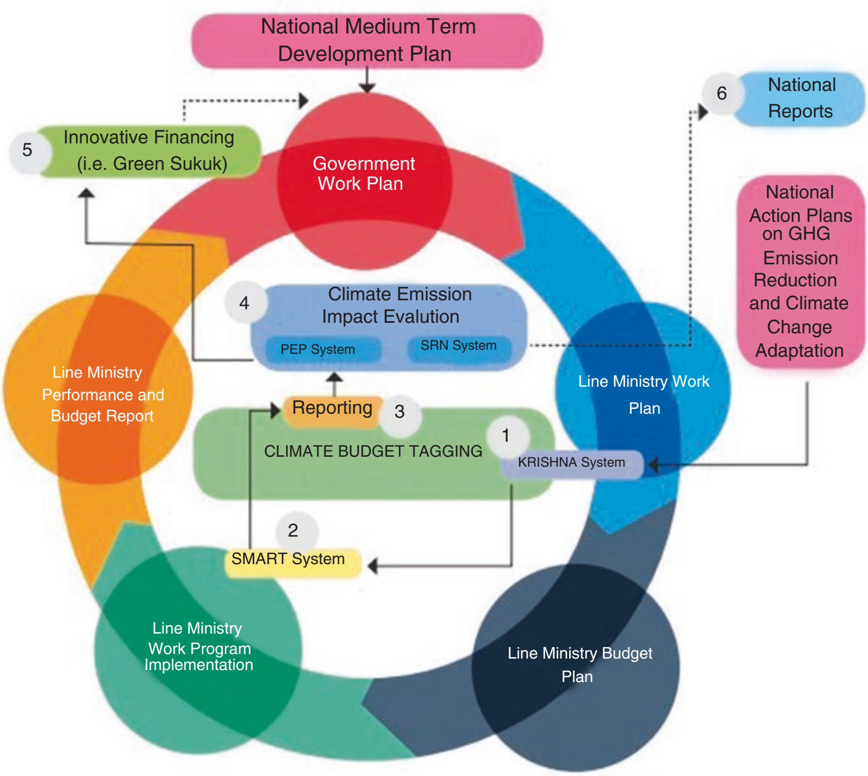


Fig. 19.9 Budget tagging in the national planning and budgeting cycle. (Source: Fiscal Policy Agency, Ministry of Finance, 2019)

recognize results that directly and indirectly impact GHG emission reductions. In this regard, GOI can identify potential projects that can be financed by Green Bond/ Sukuk issuance and other public funding sources such as balance funds (e.g., DAU, DBH, DAK), village funds, regional incentive funds, and provincial to district or city transfer instrument scheme (Fiscal Policy Agency, 2019).

In 2019, BPDLH was formed to increase the private sector's participation and leverage public and development partners' funds. BPDLH has a legal mandate but not the right to benefit, and the beneficiaries have equitable ownership, which brings the right to benefits. Nevertheless control can only be conducted by the trustee (IMF, 2001). BPDLH acts as a fund manager with flexibility in allocating funds to beneficiaries. The source of funds managed by BPDLH is from the state budget (reforestation fund), Green Climate Fund, Forest Carbon Partnership, and BioCarbon Fund.

Furthermore, GOI has issued Green Sukuk from 2018 to 2021 as an alternative instrument, reaching USD 3.5 bn of Global Green Sukuk and USD 473.1 mn of Green Sukuk Retail in 2019 until 2020. The proceeds were allocated to renewable

energy, sustainable transport, energy efficiency, waste and energy management, and resilience to climate change for highly vulnerable areas and sectors (DRR). As a result, in 2018–2020, the projected emission reduction from the issuance of green Sukuk has reached 10, 3 MtonneCO_2. Besides, the GOI has launched another sustainable financing instrument, namely, the SDGs Bond, in 2021.

Although GOI has made significant progress, particularly in financing climate actions, the Covid-19 crisis undeniably negatively affects the state budget. Because climate action cannot be addressed separately, GOI should not halt any effort to achieve its climate pledge; thus, response to both crises should be made simultaneously and embedded with the national economic recovery policies. Wyns and van Daalen (2021) argue that NDCs offer a powerful policy platform to link near-term national strategies and Covid-19 recovery efforts.

Unlike previous crises, GOI needs to identify the big picture of the Covid-19 problem. In this regard, the role of leadership played by the President is critical to determine what actions can be possibly taken in line with economic recovery policies and measure the potential impacts if GOI delays the efforts. To this, the President should keep directing KLHK to take the lead and coordinate with other ministries, particularly MoF, regarding financial resources and design climate change policies.

In response, the MoF (2020) proposes three strategies to address the NDC target, such as (i) making adjustments to action plans by considering the national economic recovery policies, (ii) prioritizing action plans that can recover the economy simultaneously, and (iii) developing innovative financing schemes and policies to encourage nongovernment parties' participation.

Strategies designed by GOI might help climate actions work during and after the pandemic. However, it is critical to consider the timeframe, requirements, and performance indicators that KLHK must formulate so the targets are relatively more measurable (Firdaus, 2020). Precise stimulus package measures help GOI minimize climate risks caused by delayed decarbonization. In the Covid-19 pandemic, the short-term objective of the economic recovery policies is to bring a significant economic impact and transform the economic structure that can ensure GOI meets its climate goals in the long term (see Fig. 19.10).

Since no one knows when the Covid-19 crisis will end, leading to uncertainty and disruptions in emission reduction plans, it is necessary to keep committing to the climate pledge. Undoubtedly, delaying actions may save money in the short run, but climate actions would be more costly in the long run. In terms of emissions, the accumulated CO_2 would surpass the carbon budget. Although the world is calling for a green economy to revitalize the existing system, considering the domestic situation with limited resources, GOI might face difficulties realizing its commitment to climate change. Thus, external supports are needed to ensure that climate actions are sustainable.

Climate change undeniably threatens the livelihoods of vulnerable communities, so it is critical to consider the microlevel in which the Covid-19 crisis may jeopardize community resilience. Financial and nonfinancial supports to that effect should be provided to guarantee vulnerable communities in meeting their needs. The

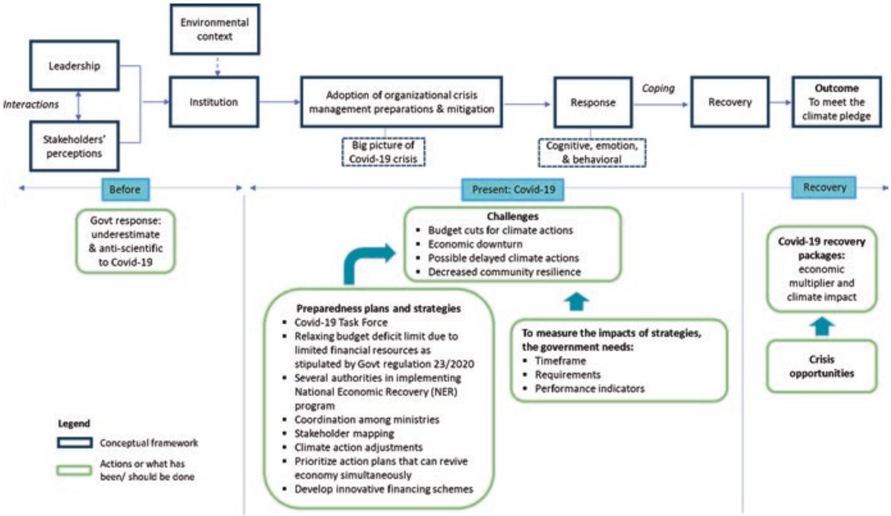


Fig. 19.10 Covid-19 crisis management in climate actions. (Source: Authors)

Covid-19 pandemic that has hit global markets and impeded trade lines affects the domestic economy so that the demand for goods produced by communities drops, and subsequently, they potentially lose their income. Therefore, managing vulnerable populations associated with climate change in the Covid-19 crisis should be included in the policies to maintain their contribution to climate adaptation and mitigation.

The national economic recovery policies support economic activities and promote economic stability. Adjusting climate action plans can be a coping strategy to ensure that GOI commits to the Paris Agreement. Consequently, Covid-19 fiscal recovery packages consider both economic multiplier and climate impact to accelerate the transition to a low-carbon economy. In other words, the Covid-19 pandemic is the moment for GOI to rebuild the economy with a new paradigm, so-called build back better, by putting forward inclusivity and sustainability. Besides, restoring public confidence is the key to sustaining climate actions where stakeholders can participate in emission reduction pathways. Nonetheless, clearly defined policies and regulations are vital as a guideline for aligning economic recovery and climate goals.

Finally, Covid-19 indicates that the world is fragile, and crisis response strategies are needed to address this fragility. GOI can take lessons from the Covid-19 crisis to reform its governance institution and reformulate strategies concerning crisis management. Addressing climate change is not similar to tackling the Covid-19 pandemic as they have different challenges. However, both climate change and Covid-19 are part of global issues requiring stakeholders to work together to find solutions. Besides, in the context of crisis management, the Covid-19 crisis has signaled GOI to develop creative and strategic thinking and evaluate aspects, such as transparency, leadership, coordination, and communication, to be more adaptive

and vigilant for the next crises. Thus, during the Covid-19 crisis, climate actions should remain in place and be prioritized so that GOI can show its commitment to the Paris Agreement.

19.5.2 The Covid-19 Crisis: Any Opportunities and Potential Challenges?

There is an opportunity in every crisis; thus, GOI can seize it to address climate change. The Covid-19 pandemic indirectly sends a message to show the weaknesses of the existing health system, causing economic shocks and ecological degradation (see Mansuy, 2020). Subsequently, redesigning the system to overcome those weaknesses to create a better world is necessary. Because of this, a "green recovery" has been intensively echoed in which Covid-19 stimulus packages should boost economic growth and stop climate change. CarbonBrief (2020) identifies countries (e.g., European Union, South Korea, India, and China) committing to cut their emissions after coronavirus through "green recovery" plans that focus on several sectors, such as agriculture, buildings, energy, employment (green jobs), industry, nature, and transport. Unlike standard recovery stimulus packages that may also include fossil companies to be bailed out, green recovery plans more focus on sustainable purposes. Hepburn et al. (2020) classify five policies that positively impact the economy and climate: clean physical infrastructure, building efficiency improvements, investment in education and training, natural capital investment, and clean R&D. However, these policies require support from both humans and institutions.

GOI's commitment toward the LCDI can be realized by adopting the principles of the circular economy that emphasize efficiency, zero waste, and zero emissions. In conjunction with the circular economy, the concept of doughnut economics becomes relevant and should be embraced for future development by considering both planetary and social boundaries (Raworth, 2017). However, implementing the green economy amid the pandemic crisis might be more challenging for Indonesia with limited financial resources. In other words, economic growth is thus far likely regarded as critical to addressing other important issues outside the ecology. Therefore, decoupling of economic growth and carbon emissions remains unsolved as economic recovery post-Covid-19 inevitably requires energy and raw materials consumption that drive an increase in CO_2 emissions (Myllyvirta, 2020).

Regardless of the problem, GOI can gradually initiate the transformation and continue the existing and planned climate-related projects in this unexpected situation. These actions should be done as soon as possible to ensure a smooth transition to a sustainable economy. Based on the assessment of fiscal recovery policies in response to the GFC, green stimulus packages have more benefits than traditional fiscal stimulus in which, in the short term, more jobs are created by renewable energy developments (Hepburn et al., 2020). They also claim that ensuring people have income during the economic slowdown is critical to boosting spending and

increasing short-term GDP multipliers. When renewables are well-established, requiring less labor but supported by technologies, the costs related to energy production decline in the long term (Blyth et al., 2014; Handayani et al., 2019; IRENA, 2017; Zhongying & Sandholt, 2019). Consequently, GOI should realize that mainstreaming climate actions in stimulus packages for recovery from the Covid-19 crisis becomes a solution to keep on track in achieving the transition to a low carbon economy.

However, during the Covid-19 pandemic, GOI released Law No. 3/2020, the amendment of Law No. 4/2009 concerning Mineral and Coal Mining. This law has been synchronized with the Job Creation Bill (UU Cipta Kerja), resulting in 15 points added as an improvement. This new law is believed to address the problems in the mining sector and provide more benefits to society, the fact that this law has raised controversy. Law No. 3/2020 has been sidelining the environment where GOI allows the expansion of mining territory to increase reserves. Whereas the world is planning a coal phase-out to reach a 1.5 economy, GOI intends to grow coal reserves. High coal reserves undeniably lead to assets stranding, so the value of reserves becomes worthless in the future due to decarbonization. Thus, the commitment to the Paris Agreement in achieving the NDC target is questionable because of the dilemma between environmental protection and economic growth.

Law No. 3/2020, on the other hand, encourages the development of downstream industries to increase the added value of mineral and coal mining. This objective should become an opportunity to revitalize the governance in coal mining through implementing a sustainable approach. DME has become an option to supply clean energy for domestic purposes that can reduce the reliance on importing LPG; it is, however, highly capital intensive and risky. Therefore, to ensure an improvement in the governance in coal mining, GOI needs to strictly regulate coal mining players to protect the environment and help reduce emissions aligning with the pursuit of economic recovery.

Another opportunity is that GOI can take advantage of the emergence of blended finance as an alternative option to mobilize public and philanthropic funds for achieving climate targets and SDGs during and post Covid-19 pandemic (see Fig. 19.11). However, since capital has never been cheaper, mobilizing public funds requires transparency and detailed information regarding the project's risk and return. Investors need attractive returns compared to other investment options. Besides, investors should be well informed about the climate actions roadmap to know their investment prospects. Also, a diversified climate project portfolio offered will boost investors' interest.

Green capital markets are proliferating worldwide in response to support green movements in addressing climate change. The most significant development climate finance instrument recently is green bonds. The World Bank Group has supported emerging markets by cooperating with HSBC and IFC, pioneering REGIO Fund as the first global green bond fund (Klein & de Bolle, 2020). This fund aims to help businesses in emerging countries mitigate climate risks by facilitating public and private capital to transition to cleaner and more efficient energy.

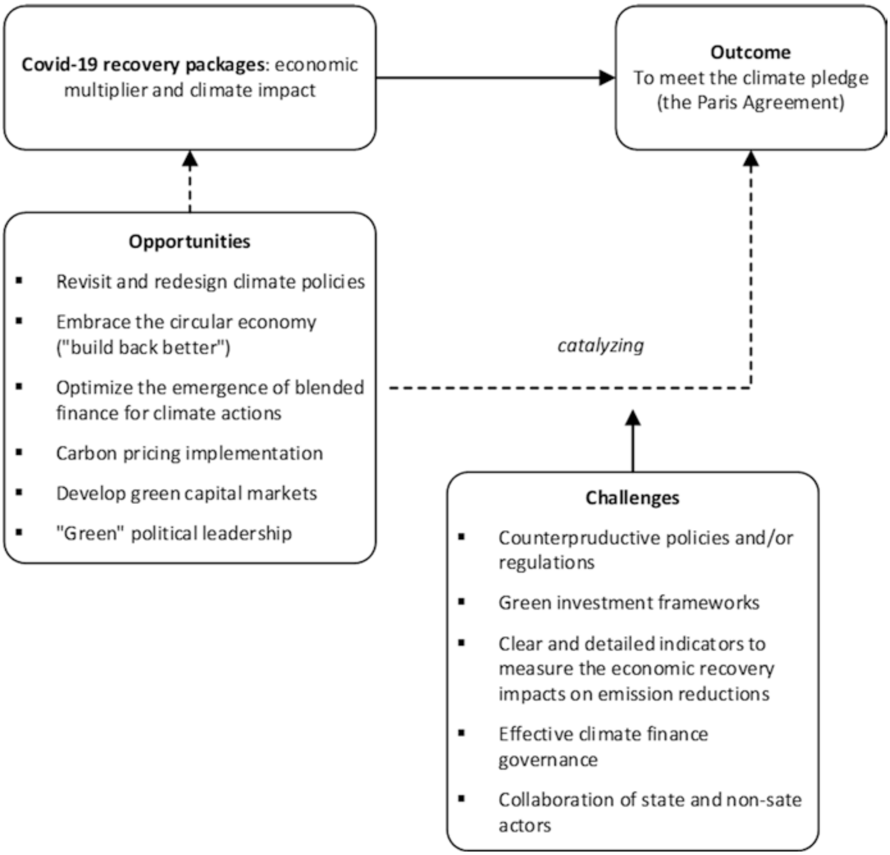


Fig. 19.11 Crisis opportunities and challenges to meet climate pledge. (Source: Authors)

Additionally, although green bonds were not immune to the Covid-19 crisis in a few months (Harrison, 2020; Yu, 2020), leading to the slowdown in bond issuance activity due to lack of green assets, the economic recovery policies materialized to help the markets to revive (Harrison, 2020). This situation provides an opportunity for the issuers, not only sovereigns but also businesses, to fund their climate-friendly projects in the future, aligning with the national economic recovery policies that are expected to stabilize the economy. In other words, GOI can encourage the private sector to participate in green bond markets as, hitherto not many Indonesian companies issue green bonds.

As the future economic situation remains uncertain, financial institutions and businesses may focus on saving their business and minimizing the long-term disruptions. Besides, undeniably the green capital markets are exposed to the Covid-19 crisis, so capital market players expect robust economic recovery policies to restore their confidence in developing the markets. Moreover, unlike green bonds, social bonds have been more attractive during the Covid-19 crisis (Yu, 2020), and they

potentially are growing to support the government in providing comprehensive recovery packages (BNP Paribas, 2020). For optimal outcomes, GOI could simultaneously combine these instruments to address the Covid-19 pandemic and climate change, but this option requires supportive policies.

Nevertheless, optimizing existing financing sources, which are not debt instruments to support clean energy projects and scale up to other climate actions, should be the top priority amid limited financial resources due to the budget reallocation for the Covid-19 crisis. This consideration is pivotal to reducing the financial burden. However, GOI needs to set measures so that the progress made can efficiently be assessed. Governance mechanisms are also crucial to ensure that funds can be utilized effectively and donors and investors meet their expectations.

Furthermore, introducing other climate finance instruments, such as carbon pricing, helps GOI to obtain a new funding source to tackle climate change and encourage nonstate actors to participate in emissions reduction. GOI has taken a significant step in carbon pricing policies, including carbon trading, RBP, carbon tax, and emission trading scheme. This action provides a long-term solution for GOI to meet its climate pledge as the Covid-19 crisis has drastically changed the economic and financial landscape. However, it is necessary to coordinate with nonstate actors, especially businesses, as they are the main stakeholder if carbon pricing is implemented. The implementation of carbon pricing should not discourage the business sector from taking action on climate change.

The role of NGOs, CSOs, and communities cannot also be neglected to channel climate funds. For instance, carbon offset instruments can be directed to communities living in the forest areas through cooperation schemes and community empowerment. This mechanism can provide sustainable livelihoods for forest communities as they are most vulnerable to climate change. To ensure such a mechanism, NGOs and CSOs can advocate communities in training and channelling to markets. Communities living in the forest areas mostly lack infrastructure, resources, and markets, so the role of NGOs and CSOs is significant.

Finally, the Covid-19 crisis opens a window of opportunity for politicians and leaders to change the rules of the game and transform institutional settings (Kuhlmann et al., 2021). Collaborative stakeholders are needed to actualize effective instruments and encourage inclusive development. The right political leadership can lead to ambitious outcomes that will have a significant impact on addressing climate change (Stojanovska-stefanova & Vckova, 2016). Therefore, it is expected that the Covid-19 crisis may accelerate countries to build back and be better and more resilient in sustainable pathways.

19.6 Conclusion

The Covid-19 crisis has disrupted climate action plans, and the impact is beyond health issues, causing a domino effect. Although the Covid-19 crisis has become the priority and current threats to be solved immediately, climate change cannot be

ignored as it is a future issue that needs a quick and effective response. Unlike the Covid-19 pandemic with direct impacts, climate change might be considered long term and has indirect impacts, but the sense of urgency should be the same. In this regard, should climate actions stay amidst the Covid-19 pandemic? The answer is "Yes." People may have adapted their lives to a sudden and significant change due to the Covid-19 pandemic; thus, climate actions should be more welcome. Besides, from the GOI's side, climate actions can go parallelly with the national economic recovery policies by emphasizing the importance of climate change actions to the society so that GOI can achieve the target during the specified time.

Aligning with efforts to overcome Covid-19 that require citizens' willingness to cooperate with the government, climate actions should be responded to similarly. It is admitted that Indonesia was stuttered to overcome the Covid-19 pandemic in the beginning, resulting in poor crisis management, but then gradually responded to the crisis with better measures. In this case, policymakers holding the authority are expected to become more responsible as they are facing two issues simultaneously. Also, strong coordination between the central government and local government is critical. In other words, multilevel collaborations are needed to minimize costs and ensure that both Covid-19 and climate change can be handled appropriately in which the role of leadership played by the President and supported by KLHK and MoF is crucial to orchestrating policies.

As in the context of crisis management, the Covid-19 pandemic is the moment for the government to seize the opportunity to redesign its climate policies, including financing mechanisms and improving climate mitigation and adaptation governance. From the Covid-19 crisis, GOI can learn the weaknesses of the current system that need to be addressed and start to rebuild with a new perspective. In other words, a new paradigm, "circular economy," which emphasizes both planetary and societal boundaries, is what the world needs for the future and GOI should move toward that paradigm. Thus, it is expected that Indonesia will be more resilient in response to climate change threats in the future.

References

Ahmad, E. (2020). Multilevel responses to risks, shocks and pandemics: Lessons from the evolving Chinese governance model. Journal of Chinese Governance, 0(0), 1–29. https://doi.org/10.1080/23812346.2020.1813395.

Ambrose, J. (2019). *Renewable energy to expand by 50% in next five years*. The Guardian. https://www.theguardian.com/environment/2019/oct/21/renewable-energy-to-expand-by-50-in-next-five-years-report

Andonova, L., Castro, P., & Chelminski, K. (2018). Transferring technologies: The polycentric governance of clean energy technology. In A. Jordan, D. Huitema, H. van Asselt, & J. Forster (Eds.), *Governing climate change: Policentricity in action?* (pp. 266–284). Cambridge University Press. https://doi.org/10.1017/9781108284646.01

Andrews, M. (2013). *The limits of institutional reform in development: Changing rules for realistic solutions*. Cambridge University Press.

Blyth, W., Gross, R., Speirs, J., Sorrell, S., Nicholls, J., Dorgan, A., & Hughes, N. (2014). *Low carbon jobs: The evidence for net job creation from policy support for energy efficiency and renewable energy*. UK Energy Research Centre. https://d2e1qxpsswcpgz.cloudfront.net/uploads/2020/03/low-carbon-jobs.pdf

BNP Paribas. (2020, July 27). *Capital markets and Covid-19: have social bonds come of age?* https://cib.bnpparibas.com/sustain/capital-markets-and-covid-19-have-social-bonds-come-of-age-_a-3-3503.html

Boin, A., Hart, P., Stern, E., & Sundelius, B. (2005). *The politics of crisis management: Public leadership under pressure*. Cambridge University Press.

Brockington, D. (2012). A radically conservative vision? The challenge of UNEP's towards a green economy. *Development and Change, 43*(1), 409–422. https://doi.org/10.1111/j.1467-7660.2011.01750.x

Bundy, J., Pfarrer, M. D., Short, C. E., & Coombs, W. T. (2017). *Crises and crisis management: Integration, interpretation, and research development* (Vol. 43).

CarbonBrief. (2020). Coronavirus: Tracking how the world's 'green recovery' plans aim to cut emissions. *Carbon Brief*. https://www.carbonbrief.org/coronavirus-tracking-how-the-worlds-green-recovery-plans-aim-to-cut-emissions

Climate Action Tracker. (2019, May 3). *Climate Action Tracker: Indonesia*. https://climateactiontracker.org/countries/indonesia/

Dagnet, Y., Cogswell, N., & Mendoza, J. M. (2020). 4 ways to strengthen climate action in the wake of COVID-19. *World Resources Institute*. https://www.wri.org/blog/2020/05/coronavirus-strengthen-climate-action

Death, C. (2015). Four discourses of the green economy in the global South. *Third World Quarterly, 36*(12), 2207–2224. https://doi.org/10.1080/01436597.2015.1068110

Dwisatrio, B., Said, Z., Permatasari, A., Maharani, C., Moeliono, M., Wijaya, A., Lestari, A. A., Yuwono, J., & Thuy, P. T. (2021). *The context of REDD+ in Indonesia: Drivers, agents and institutions* (2nd edn.) (No. 216; CIFOR occasional paper). https://www.cifor.org/publications/pdf_files/OccPapers/OP-216.pdf

Environmental Finance. (2020, May 5). Nobel prize-winning economist calls for Green Deal after Coronavirus. *Environmental Finance*. https://www.environmental-finance.com/content/news/nobel-prize-winning-economist-calls-for-green-deal-after-coronavirus.html.

Farazmand, A. (2014). Crisis and emergency management: Theory and practice. In A. Farazmand (Ed.), *Crisis and emergency management: Theory and practice* (2nd ed., pp. 1–9). CRC Press.

Firdaus, N. (2020). *Stimulus Covid-19, Pencapaian Target Iklim, dan Tantangan Sektor Bisnis*. https://money.kompas.com/read/2020/07/14/060700526/stimulus-covid-19-pencapaian-target-iklim-dan-tantangan-sektor-bisnis

Fiscal Policy Agency. (2019). *Pendanaan Publik Untuk Pengendalian Perubahan Iklim Indonesia Tahun 2016–2018*.

Gilpin, D. R., & Murphy, P. J. (2008). *Crisis management in a complex world*. Oxford University Press.

Goldin, I. (2020, April 21). Coronavirus is the biggest disaster for developing nations in our lifetime. *The Guardian*. https://www.theguardian.com/commentisfree/2020/apr/21/coronavirus-disaster-developing-nations-global-marshall-plan

Government of the Republic of Indonesia. (2018). *Indonesia second Biennial update report*. Directorate General of Climate Change, Ministry of Environment and Forestry. https://unfccc.int/sites/default/files/resource/Indonesia-2nd_BUR.pdf

Government of the Republic of Indonesia. (2021). *Indonesia long-term strategy for low carbon and climate resilience (LTS LCCR) 2050*. https://unfccc.int/sites/default/files/resource/Indonesia_LTS-LCCR_2021.pdf

Guterres, A. (2020). Remarks to Petersberg climate dialogue. *United Nations Secretary-General*. https://www.un.org/sg/en/content/sg/speeches/2020-04-28/remarks-petersberg-climate-dialogue.

Halimanjaya, A., Nakhooda, S., & Barnard, S. (2014). *The effectiveness of climate finance: A review of the Indonesia climate change trust fund* (Issue March).

Handayani, K., Krozer, Y., & Filatova, T. (2019). From fossil fuels to renewables: An analysis of long-term scenarios considering technological learning | Elsevier enhanced reader. *Energy Policy, 127*. https://doi.org/10.1016/j.enpol.2018.11.045

Harrison, C. (2020). EUR green bonds pricing dynamics H1 2020. *Webinar: Green Bond Pricing in Primary Market*. https://www.youtube.com/watch?v=gu3AamUsGYw&amp%3Bt=3s.

Henderson, L. J. (2014). Managing human and natural disasters in developing nations: Emergency management and the public bureaucracy. In A. Farazmand (Ed.), *Crisis and emergency management: Theory and practice* (2nd ed., pp. 317–330). CRC Press.

Hepburn, C., O'Callaghan, B., Stern, N., Stiglizt, J., & Zenghelis, D. (2020). Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? *Oxford Smith School of Enterprise and the Environment.* https://www.smithschool.ox.ac.uk/publications/wpapers/workingpaper20-02.pdf

Hickel, J., & Kallis, G. (2019). Is green growth possible? *New Political Economy.* https://doi.org/10.1080/13563467.2019.1598964

Howarth, C., Bryant, P., Corner, A., Fankhauser, S., Gouldson, A., Whitmarsh, L., & Willis, R. (2020). Building a social mandate for climate action: Lessons from COVID-19. *Environmental and Resource Economics, 76*(4), 1107–1115. https://doi.org/10.1007/s10640-020-00446-9

Indonesia Climate Change Trust Fund [ICCTF]. (2021). *Laporan Triwulan 1: Januari - Februari - Maret 2021*.

Indrarto, G. B., Murharjanti, P., Khatarina, J., Pulungan, I., Ivalerina, F., Rahman, J., Prana, M. N., Resosudarmo, I. A. P., & Muharrom, E. (2012). *The context of REDD+ in Indonesia: Drivers, agents, and institutions* (No. 92; CIFOR occasional paper). https://www.cifor.org/publications/pdf_files/WPapers/WP92Resosudarmo.pdf

International Renewable Energy Agency [IRENA]. (2017). *Renewable power generation costs in 2017*. International Renewable Energy Agency [IRENA]. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jan/IRENA_2017_Power_Costs_2018.pdf

International Renewable Energy Agency [IRENA]. (2019). *Renewable Capacity Statistics 2019*. International Renewable Energy Agency [IRENA]. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Mar/IRENA_RE_Capacity_Statistics_2019.pdf

International Renewable Energy Agency [IRENA]. (2020). *Renewable capacity statistics 2020*. https://irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Statistics_2020.pdf

Jordan, A., Huitema, D., Schoenefeld, J., van Asselt, H., & Forster, J. (2018a). Governing climate change Polycentrically. In A. Jordan, D. Huitema, H. van Asselt, & J. Forster (Eds.), *Governing climate change: Polycentricity in action?* (pp. 3–26). Cambridge University Press. https://doi.org/10.1017/9781108284646.002

Jordan, A., Huitema, D., van Asselt, H., & Forster, J. (2018b). Governing climate change: The promise and limits of polycentric governance. In A. Jordan, D. Huitema, H. van Asselt, & J. Forster (Eds.), *Governing climate change: Policentricity in action?* (pp. 359–383). Cambridge University Press. https://doi.org/10.1017/9781108284646.021

Jowell, A., & Barry, M. (2020). COVID-19: A matter of planetary, not only national health. *American Journal of Tropical Medicine and Hygiene, 103*(1), 31–32. https://doi.org/10.4269/ajtmh.20-0419

Klein, A., & de Bolle, P. (2020). *Green bonds become real in emerging markets*. https://blogs.worldbank.org/climatechange/green-bonds-become-real-emerging-markets.

Kuhlmann, S., Bouckaert, G., Galli, D., Reiter, R., & Van Hecke, S. (2021). Opportunity management of the COVID-19 pandemic: Testing the crisis from a global perspective. *International Review of Administrative Sciences.* https://doi.org/10.1177/0020852321992102

Leahy, S. (2019). Most countries aren't hitting Paris climate goals, and everyone will pay the price. *National Geographic* https://www.nationalgeographic.com/science/2019/11/nations-miss-paris-targets-climate-driven-weather-events-cost-billions/

Lidskog, R., Elander, I., & Standring, A. (2020). COVID-19, the climate, and transformative change: Comparing the social anatomies of crises and their regulatory responses. *Sustainability (Switzerland), 12*(16), 1–21. https://doi.org/10.3390/SU12166337

Mansuy, N. (2020). Stimulating post-COVID-19 green recovery by investing in ecological restoration. *Restoration Ecology, 28*(6), 1343–1347. https://doi.org/10.1111/rec.13296

Ministry of Energy and Mineral Resources of Indonesia [MEMR]. (2020). *Handbook of Energy & Economic Statistics of Indonesia*.

Ministry of Environment and Forestry [KLHK]. (2020). *Laporan Kinerja Kementerian Lingkugan Hidup dan Kehutanan*.

Ministry of Finance Republic of Indonesia [MoF]. (2020). *Dukungan Fiskal di tengah Pandemi COVID-19 dan Pencapaian Target NDC Pasca Pandemi: Pemulihan Ekonomi Nasional (PEN) dan Pembiayaan Perubahan Iklim Pasca Pandemi*.

Ministry of National Development Planning [Bappenas]. (2012). *National Action Plan for Climate Change Adaptation*.

Ministry of National Development Planning [Bappenas]. (2019). *National Adaptation Plan Executive Summary*.

Mizrahi, S., Vigoda-Gadot, E., & Cohen, N. (2021). How well do they manage a crisis? The Government's effectiveness during the COVID-19 pandemic. *Public Administration Review, 00*, 1–11. https://doi.org/10.1111/puar.13370

Mraz, M. (2021). *Identifying potential policy approaches under article 6 of the Paris agreement: Initial lessons learned*. https://gggi.org/site/assets/uploads/2021/01/Policy-Approaches-under-PA-Article-6210121.pdf.

Myllyvirta, L. (2020). Analysis: Coronavirus temporarily reduced China's CO_2 emissions by a quarter. *Carbon Brief*. https://www.carbonbrief.org/analysis-coronavirus-has-temporarily-reduced-chinas-co2-emissions-by-a-quarter.

Oyama, T. (2010). *Post-crises risk management: Bracing for the next perfect storm*. Wiley.

Pearson, C. M., & Clair, J. A. (1998). Reframing crisis management. *The Academy of Management Review, 23*(1), 59–76. https://doi.org/10.2307/259099

Pearson, C. M., & Mitroff, I. I. (1993). From crisis prone to crisis prepared: A framework for crisis management. *Academy of Management Perspectives, 7*(1), 48–59. https://doi.org/10.5465/ame.1993.9409142058

Raworth, K. (2017). *Doughnut economics: Seven ways to think like a 21st-century economist*. Random House Business Books.

Ruiu, M. L. (2020). Mismanagement of Covid-19: Lessons learned from Italy. *Journal of Risk Research, 23*(7–8), 1007–1020. https://doi.org/10.1080/13669877.2020.1758755

Sheriffdeen, M., Nurrochmat, D. R., Perdinan, & Di Gregorio, M. (2020). Indicators to evaluate the institutional effectiveness of national climate financing mechanisms. *Forest and Society, 4*(2), 358–378. https://doi.org/10.24259/fs.v4i2.10309

Stojanovska-stefanova, A., & Vckova, N. (2016). International Strategy For Climate Change And The Countries Commitment For Developing Policies. In: *International Scientific Conference: Crisis Management: Challenges and Perspective*, 18 Nov 2015, Skopje, Macedonia.

The Economist. (2020). Covid-19 and climate change: Clear thinking required. *The Economist*, 76–78.

Tienhaara, K. (2014). Varieties of green capitalism: Economy and environment in the wake of the global financial crisis. *Environmental Politics, 23*(2), 187–204. https://doi.org/10.1080/09644016.2013.821828

United Nations Development Programme [UNDP]. (2020, May 10). *COVID-19: Looming crisis in developing countries threatens to devastate economies and ramp up inequality*. United Nations Development Programme [UNDP]. https://www.undp.org/content/undp/en/home/news-centre/news/2020/COVID19_Crisis_in_developing_countries_threatens_devastate_economies.html

United Nations Environment Programme [UNEP]. (2009). *Global green new deal policy brief*. United Nations Environment Programme [UNEP]. https://wedocs.unep.org/bitstream/handle/20.500.11822/7903/A_Global_Green_New_Deal_Policy_Brief.pdf?sequence=3&amp%3BisAllowed=

van Asselt, H., & Zelli, F. (2018). International governance. In A. Jordan, D. Huitema, H. van Asselt, & J. Forster (Eds.), *Governing climate change: Polycentricity in action?* (pp. 29–46). Cambridge University Press. https://doi.org/10.1017/9781108284646.003

Wanner, T. (2015). The new ‘passive revolution’ of the green economy and growth discourse: Maintaining the ‘sustainable development’ of neoliberal capitalism. *New Political Economy, 20*(1), 21–41. https://doi.org/10.1080/13563467.2013.866081

Watson, S. R., McCarthy, J. J., Canziani, P., Nakicenovic, N., & Hisas, L. (2019). *The truth behind the climate pledges*.

Wyns, A., & van Daalen, K. R. (2021). From pandemic to Paris: The inclusion of COVID-19 response in national climate commitments. *The Lancet Planetary Health, 5*(5), e256–e258. https://doi.org/10.1016/S2542-5196(21)00111-X

Yu, D. (2020). Green bonds not immune to Covid-19 impact. *The Asset*. https://www.theasset.com/article-esg/40386/green-bonds-not-immune-to-covid-19-impact

Zhongying, W., & Sandholt, K. (2019). Thoughts on China’s energy transition outlook. *Energy Transitions, 3*, 59–72. https://doi.org/10.1007/s41825-019-00014-w

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Chapter 20
Climate Action in a Far-Flung Archipelagic Nation: Outlining Challenges in Capacity-Building

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Abstract This climate action study illustrates the issues of capacity-building in the highly complex governance setting of Indonesia's more than 500 districts, each with their specific issues around mitigation and adaptation that pose challenges for both top-down and, equally important, bottom-up approaches. Some regions have made commendable progress; however, there is benefit in ensuring that the progress in

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one region is sufficient to establish it as a benchmark for others. Institutionalization of capacity-building is key in highlighting the role of civil society networks—especially those that can reach the far-flung districts of Indonesia—in creating trust in the regions where they are distributed.

Keywords Capacity-building · NDC · National subnational integration · Molucca Islands, Indonesia

20.1 Introduction

Strengthening the capacity and ability of developing countries and those with economies in transition to undertake effective climate responses has received increased attention since 2001. Two frameworks provided initial guidance for capacity-building (Decisions 2/CP.7 and 3/CP.7 of the Conference of Parties 7, Annex). In 2009, capacity-building became part of the ad hoc negotiation of the Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) and later served as a basis for the establishment of the Durban Forum on Capacity-building at the Conference of Parties 17 (Karuniasa, 2018a, b).

The importance of capacity-building activities is further substantiated by Article 11 of the Paris Agreement (CP.21). Attention is called to relevant measures such as facilitating technology development, dissemination and deployment, access to climate finance, relevant aspects of education, training and public awareness, and the transparent, timely, and accurate communication of information. Article 11 further stipulates that for the effective implementation of the Paris Agreement, developed countries should enhance the support for capacity-building actions in developing countries.

Further, as stipulated by decision 16/CP.22, capacity-building serves as an effective means to facilitate the implementation of undertakings of the convention and Paris Agreement by developing countries. The key to effective implementation is the development of a suitable road map for capacity-building.

Capacity-building can be viewed as enhancing the ability of individuals, organizations, and institutions in developing countries to identify, plan, and implement ways to mitigate and adapt to climate change (Brinkerhoff & Morgan, 2010; Le et al., 2017; UNFCCC, n.d.). Under the United Nations regime, three levels of capacity-building are recognized: (1) establishment of education, training, and awareness activities; (2) fostering the development of organizations and institutions to encompass their mandate, mission, culture, structure, competence, human resources, and finances, as well as cooperation between organizations, institutions, and sectors; and (3) the creation of enabling environments through economic policies, regulations, and accountability frameworks through which organizations and individuals operate (UNDP, 2009).

The complexity of capacity-building issues is exemplified by Indonesia, with its 35 provinces and 514 districts. Indonesia's decentralization—or devolution of governing powers to districts—since 1999 (Leitmann et al., 2009)[1] has been challenged for the lack of harmonization between the speed at which the central government carried out the devolution of governing powers and the ability of subnational levels to progress with limited available guidance.

Indonesia's drive to implement its Nationally Determined Contribution (NDC)—which aims to contribute to the concerted efforts preventing a 2 °C increase in global average temperature and to pursue efforts to limit the temperature increase to 1.5 °C above preindustrial levels—called for serious capacity-building tasks across all levels and sectors. Indonesia's first NDC (RI, 2016), submitted to the UNFCCC in November 2016, served to establish the transparency framework required by the Paris Agreement and outlined enhanced actions and the necessary enabling environment during 2015–2019 that formed the foundation for more ambitious goals beyond 2020. Indonesia's First NDC submission was, however, not yet accompanied by a road map for capacity-building. In 2021, Indonesia submitted Updated NDC[2] together with Long Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR).[3]

To date, capacity-building objectives have been incorporated into the components of the nation's NDC implementation, namely, mitigation (including the mainstreaming of national and subnational mitigation action plans), adaptation and loss and damage (including mainstreaming of adaptation action plans), means of implementation, and a transparency framework (including measurement, reporting, verification—MRV and the national communications). Further, as part of the mitigation actions, market-based mechanisms have become increasingly instrumental and engaged.

This study explores capacity-building issues from both the national and subnational perspectives. The rationale for this study is that capacity-building and coordination should function together both vertically and horizontally (cross-sectoral dimensions); thus, both should be explored. To be integrative and holistic, further policy reforms and institutionalization are needed. The main question is the extent of these measures, including challenges and opportunities, and especially to consider how necessary progress may be implemented on the ground, and how to induce the national and subnational integration toward more effective capacity-building. This study aims to present a synthesis of relevant capacity-building measures to date, and extract the lessons learned, especially concerning

[1] However, the tug of war between national and subnational powers led to the transition of the 1999 decentralization policy to a new one in 2014. As the new policy (Law 23/2014) stipulated that the management of forest, maritime, and energy and mineral resources was to be governed by central and provincial governments, the pendulum moves back to the national government and its deconcentrated arms (i.e., provinces).

[2] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Indonesia%20First/updated%20NDC%20Indonesia%202021%20-%20corrected%20version.pdf

[3] https://unfccc.int/sites/default/files/resource/Indonesia_LTS-LCCR_2021.pdf

institutionalization. The novelty of this study rests on navigating through multisectoral and multilayered bureaucracy and ultimately reflecting on the institutionalization of mechanisms to deliver sustainable solutions.

20.2 Methods

This study reviews both published and unpublished documents. The latter includes the authors' collective experiences in delivering capacity-building and knowledge management concerning climate change, disaster risk reduction, forestry, landscape approaches, natural resources management, sustainable financing, and both policy and institutional arrangements.

Capacity-building as a positive aspect of Indonesia's NDC implementation strategies is first introduced, followed by the delineation of gaps analyzed, including mitigation and adaptation priorities. The existing policy and institutional framework at the national and subnational levels are synthesized, with examples from the relatively progressive subnational NDC implementation strategy of Maluku province. Examples of sporadic capacity-building activities that indicate inadequate integration are explored. Basic challenges for policymakers and institutions are outlined, followed by opportunities, especially as they relate to climate finance. Notable capacity-building issues at the subnational level are explored. The role of international cooperation is also considered in light of the potentials for fostering capacity-building. The discussion summarizes these issues by considering the importance of integration and institutionalization.

20.3 Results

20.3.1 Capacity-Building as Part of Indonesia's NDC Implementation Strategies

Indonesia has delineated nine implementation strategies pertaining to national policy directives, (see Table 20.1). Capacity building stands as its own thread, and prioritizes the synergizing of NDC with development and spatial planning.

20.3.2 Gaps to Be Analyzed

Capacity gaps and capacity-building needs can be analyzed at two levels—systems and institutions—with two pillars of NDC providing solid bases: (i) the implementation strategy of Indonesia's NDC, and (ii) the key components of the NDC

Table 20.1 Indonesia's NDC Implementation Strategies (DJ PPI, 2016; RI, 2017)

I. Building ownership and commitment	Targeting multiple national and subnational actors and stakeholders including government agencies, legislature, private sector, financial institutions, civil society (including academicians and experts), with all measures based on complementing contexts of national and local ecosystems, social, and economy.
II. Capacity-building	Building capacities and technologies at system, institution, and individual level including (1) elaboration of NDC sector and subnational entities; (2) GHG inventory; (3) NDC implementation; (4) NDC review and monitoring, reporting, and verification—MRV; and (5) integration of the NDC with the development planning system, and spatial planning.
III. Enabling environment	(1) act 16/2016 regarding ratification of Paris agreement; (2) government regulation 46/2016 regarding the implementation of strategic environmental assessment—SEA; (3) SEA for major policies, plans, and programs that are likely to impact socially, economically, and ecologically such as those on development planning, spatial planning, the establishment of forest management units—FMU, energy, and electricity policies; (4) strategy for sustainable development; and (5) strengthening of watershed institutions.
IV. Developing a framework and network	Developing synergies across sectors, subnational entities, and actors, through schemes such as national and subnational *NDC implementation frameworks*, and *National Communication Network for NDC implementation.*
V. One GHG data policy	Ensuring that under at national and subnational levels, data are integrated into the national inventory system for GHG (called SIGN SMART); MRV; mitigation actions, adaptation actions, joint mitigation and adaptation, and *means of implementation* (finance, technology and capacity-building) with the effective capture of five key modules (energy, waste, industrial process and product uses, agriculture, and forestry).
VI. Organizing of policy, plans, and programs (=KRP) of intervention	(1) aligning NDC into development planning in the five category sectors (energy, waste, industrial process and product uses, agriculture, and forestry); (2) assuring financial support (public funds); and (3) mobilizing resources (national and international).
VII. Developing guidance for NDC implementation	Guidance for both national and subnational levels encompassing planning, implementation, MRV, NDC review.
VIII. NDC implementation	Referring to program VI (=KRP), planning NDC implementation—Coordinated by Ministry of Environment and forestry, and Ministry of Planning, respectively—Of emission reduction targets and climate change policies, and development planning; with the further stages including *NDC subnational implementation framework.*
IX. MRV	By 2020, there will be NDC review, and if needed NDC adjustment, with the commitment not to backslide.

implementation concept. The capacity gap at the system level is harnessed by development planning, which primarily challenged unaligned political processes (Fig. 20.1). At the institutional level, the main challenge was unaligned sectoral interest and agenda (Fig. 20.2).

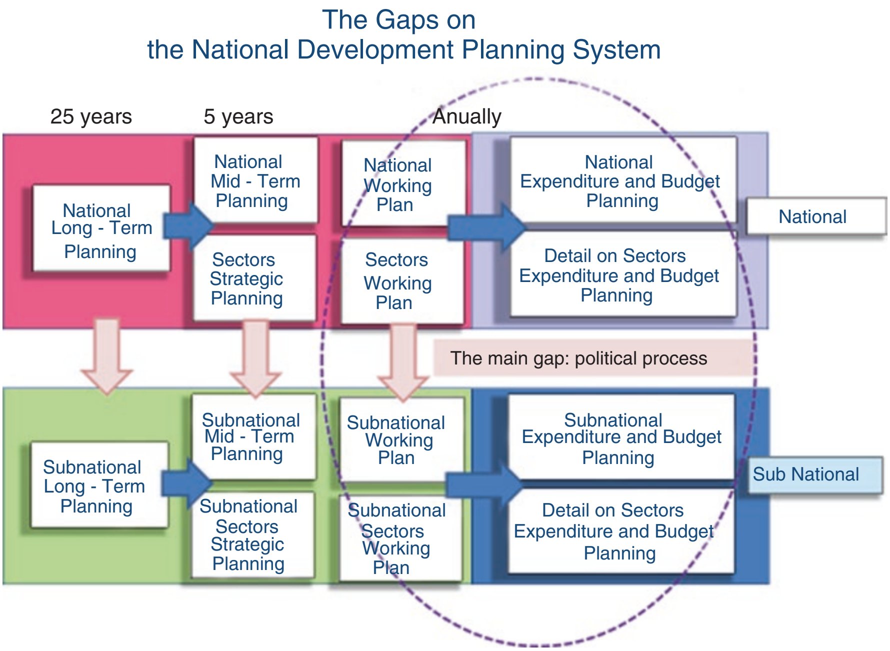


Fig. 20.1 Capacity issues at the system level (Karuniasa, unpublished)

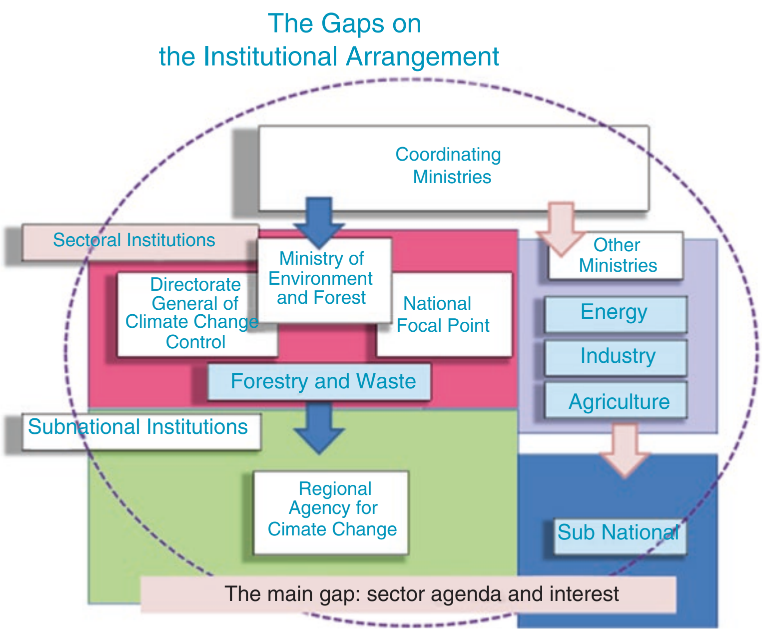


Fig. 20.2 Capacity issues at the institutional level (Karuniasa, unpublished)

Both systems and institutions remain in their early development stages. An assessment of gaps suggests that the mainstreaming of climate change issues into the system is still in the planning phase with the focus limited to institutions under MoEF. Limited ownership by institutions outside the MoEF causes weak connectivity, commitments, and coordination crucial for building comprehensive measures to respond to climate change. Political will and support from the executive and legislative divisions are indispensable to realizing programs. To enhance connectivity coordination across sectors, the roles of coordinating ministries must be enhanced (Karuniasa, 2018a, b).

20.3.3 Identified Gaps

The gap analysis for each sector naturally needs to relate to Indonesia's NDC to 2030, and more recently, the National Adaptation Plans. Initially, capacity gaps on mitigation can primarily be deduced from data recording of greenhouse gases (GHG) emissions, emission modeling, business-as-usual projections, and expected trends versus targets. The key to the development of an emission database is a single data policy, together with an agreement on annual emissions at business-as-usual projections. Further, the gap in mitigation capacity can be identified from existing national and/or sectoral emissions by comparing actual performance versus business-as-usual.

At the national level, gaps have been provisionally identified (Table 20.2). Specific local approaches are also needed, whereby provinces' development requirements and strategies differ.

20.3.4 Capacity-Building Priorities

In following the country's NDC, Indonesia's capacity-building is geared to tackle key sectors of adaptation, such as climate risk and vulnerability assessment, disaster preparedness, gender-responsive budgeting; and mitigation focusing on five key sectors: energy, land, agriculture, waste, and industrial processes and product use (IPPU).

The Republic of Indonesia's Ministry of Environment and Forestry (KLHK), in cooperation with the European Union, has formulated an analysis for capacity-building and technology needs for climate change actions (EU and Republic of Indonesia, 2018). The five steps promoted by the UNDP (Capacity Development Group) in 2009 are also central to the consideration: (1) engage stakeholders in capacity development; (2) assess capacity assets and needs; (3) formulate a capacity development response; (4) implement a capacity development response; and (5) evaluate capacity development. Further, the analysis is applied to both levels of the nine strategies and the five means of implementation.

Table 20.2 Initial gap identification (Karuniasa, 2018a, b)

Field	Gaps	Potential solution
Mitigation and adaptation	The national capacity-building system is yet to be built. Further effective stakeholder engagement, perhaps as a good part of institutionalization, is yet to be achieved.	A capacity-building hub (and multistakeholder forum) is needed to build connectivity and network among relevant actors, forums, experts, capacity-building centers and supporting entities. There should be suitable plans, implementation, and M & E accordingly.
Mitigation and adaptation	In the enabling environment, there are still gaps, especially to support low carbon and resilient development and spatial planning.	Regulations, policies, plans, and programs must progress to support sustainable development. The laws and regulations related to climate change control also must be improved.
Mitigation	Policies and activities related to national MRV (measurement-reporting-verification) showed some progress, but not without gaps. The national MRV system was still in a developing stage, while the national registry system (SRN), which has been operational in support of the national MRV, is yet to be effectively integrated. The MRV still needs to be adequately integrated with the development planning and other governance systems, and nonstate stakeholders.	The national MRV must be strengthened and the national registry system (NRS) integration into the development planning and other governance systems, and nonstate stakeholders must be accelerated.
Adaptation	Reliable measurements must be established, especially to capture the wide range and depth of climate change aspects such as exposure, sensitivity, and potential impacts.	International consensus or guidance on adaptation with clear scoping of exposures, sensitivity, potential impacts, and adaptive capacity, to accelerate adaptation measures.
Mitigation and adaptation	As a key to supporting NDC implementation, the one data Policy has been established. Operationalizing one data Policy at subnational levels and institutions outside the MoEF, however, remain limited.	A concerted effort on the mainstream and accelerated *on-the-ground* implementation of the one data Policy program is needed.

(continued)

Table 20.2 (continued)

Field	Gaps	Potential solution
Mitigation and adaptation	The means of implementing the program (involving finance, technology, capacity-building) as pertaining to both nationally determined contribution and National Adaptation Funds is challenged by gaps. These include the ability of stakeholders and institutions to access finance, a lack of domestic technology, the compatibility and feasibility of imported technology, and capacity-building activities at program and project levels.	The means of implementation require significant improvement in accessing finance, accelerating technological development, and the development of capacity-building systems.
Mitigation and adaptation	Cross-sectoral coordination forms part of the gaps. Indonesia commits to periodically communicate its greenhouse gases emissions from various sectors through national communications (NCs) and biennial update reports (BURs). Indonesia has developed national transparency framework, through (i) the national registry system (NRS) for mitigation, adaptation, and means of implementation, (ii) the national greenhouse gases inventory system, (iii) the measurement-reporting-verification (MRV) system for mitigation including reducing emissions from deforestation and forest degradation (REDD+), (iv) the safeguard information system for REDD+, (v) information system for vulnerability, and (vi) the joint adaptation and mitigation at the village level. The gaps in the transparency framework were mainly related to the realization of the framework in other ministries or institutions outside the Ministry of Environment and forestry, as well as at a provincial, private sector, and community level.	The government and stakeholders must strengthen the involvement of other ministries or institutions outside the MoEF, provinces, private sector, and communities.
Mitigation and adaptation	In terms of vertical coordination, designated subnational focal points to initiate or engage on the communication networks are yet to be established.	The subnational focal points should be established to enable communication among them.

20.3.5 Existing Policy and Institutional Framework at the National Level

The strengthened capacity of sectors and local government is central to the aims of the National GHG Inventory System (SIGN-SMART) as part of the National Registry System (SRN). The National GHG Inventory System lists the following factors:

1. Improvement of methodologies, activity data, and emission factors.
2. Strengthening institutional arrangements, their functions, and operations for archiving, updating, and managing greenhouse gas inventories.
3. Increasing the awareness of local governments on the importance of the National GHG Inventory for developing mitigation strategies.
4. Increasing the capacity of designated personnel for developing and managing each sector of the GHG Inventory.

Although the provincial level action plan for GHG mitigation (RAD GRK) has been set to follow the mandate outlined by the National Level Action Plan (RAN-GRK) of 2011,[4] not all sectors and subnational entities have used the National GHG Inventory system, making this a priority capacity-building issue. The urgency is heightened by the need to harmonize plans across sectors and layers. Fortunately, provincial-level climate action plans are required to harmonize with the province's medium-term planning; thus, although the provincial level GHG action plan does not always present capacity-building pathways, there are opportunities to do so through the medium-term planning processes (WWF Indonesia, 2017).

As for adaptation, capacity-building may be provided through the framework of the National Action Plan for Climate Change Adaptation (RAN-API), which is supported by climate data (from the Meteorology, Climatic, and Geophysical Agency) and Vulnerability Information System and Index Data (SIDIK). SIDIK is an online tool that provides (biophysical, social, and economic) vulnerability data at the subnational level and an interface for local governments to undertake self-assessments and responses.

For NDC preparation and implementation, five priorities have been identified that relate to strengthening capacity at the institutional and individual levels: (1) calculation of sector−/areal-based emissions, (2) development of sectoral−/areal-based NDC model for the projection of BAU emissions, with conditional and unconditional scenarios, (3) establishment of sectoral−/areal-based NDC implementation plans, (4) review of the implementation or MRV for the NDC, and (5) integration of the NDC implementation plans to the national and subnational development plans (DJ PPI, 2016).

Meanwhile, mechanisms for green budgeting and budget tagging as well as innovative financing schemes, such as green bonds, blended finance, and private green financing from the Financial Authority Board, are also advancing. The ecological transfer mechanism is finding good traction with progressive climate change policymaking in Indonesia (Putra et al., 2019).

[4]As instructed by Presidential Regulation no 61 of the Year 2011 regarding National Action Plan for GHG emissions reduction.

20.3.6 Existing Policy and Institutional Framework at the Subnational Level

Currently, legal frameworks for climate financing of subnational entities are yet to be adequately developed (Tänzler & Maulidia, 2013). For instance, special allocation funds and revenue sharing mechanisms may be useful for climate financing, but only on the condition that national-subnational fiscal transfer policies are reformed (Imelda et al., 2017). The plan to establish a subnational incentive funds (DID) policy to incentivize low carbon development in the districts and municipalities is a promising move.

At the subnational level, a road map for mitigation and adaptation, which includes a capacity building and technology needs assessment (CBTNA, Fig. 20.3), is needed. The Maluku province was the first to develop a CBTNA, although the pathways are not yet detailed. Subnational CBTNA from Maluku therefore was taken as a case study.

Maluku's climate policy process was launched when the planning board of Maluku Province issued its subnational scheme (RAD GRK) in 2012 while translating the National Action Plan for GHG Mitigation (RAN-GRK). A disaster risk analysis was conducted in 2015 with the assistance of the Disaster Management Agency (BNPB). In the same year, a master plan for the development of priority island-based commodities was developed. In 2016, the Maluku Governor issued decree 46/2016, which established the province's forum for disaster risk mitigation. In 2017, with the help of the USAID APIK Programme, a climate risk and vulnerability analysis was completed. The province is currently finalizing local legislation for disaster risk reduction and mitigation.

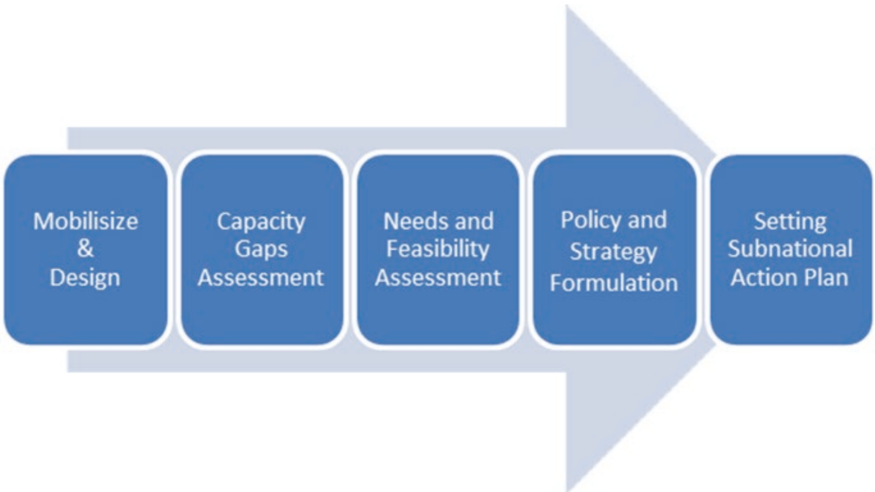


Fig. 20.3 General workflow for national and subnational CBTNA (Source: Karuniasa, 2018a, b)

In its roadmap, the Maluku province has also identified key issues. For adaptation, the strategic issues encompass fisheries, tourism, clean water, agriculture, forestry, marine transportation, and disaster risk reduction. For mitigation, five key focus sectors were identified (Table 20.3).

For the subnational NDC of Maluku province, the implementation strategy was formulated (Table 20.4) concerning the *NDC Implementation concept* as outlined by UNFCCC's mandate and guidance, with quick wins geared from 2017 to 2020.

20.3.7 Nationwide Capacity-Building Measures Implemented

Initial capacity-building was designated mostly at the national level; between 2000 and 2008, at least 91 activities were recorded on the ground. These were national initiatives supported by development partners, including Japan, Germany, the United States, Canada, the Netherlands, other EU countries, Australia, the Asian Development Bank, the World Bank, and the United Nations Development Programme (RI, 2017).

Over the following 10 years, through the implementation of market-based mechanisms such as the Clean Development Mechanism and Joint Credit Mechanism, hundreds of capacity-building actions were carried out at both national and subnational levels. A road map study undertaken for KLHK and GIZ between 10 December 2018 and 10 December 2019, on NDC implementation capacity-building, listed no less than 693 activities (Bassar & Impron, 2019). These included the

Table 20.3 The five NDC sectors for mitigation in Maluku province (Karuniasa, 2018a, b)

NDC sector	Strategic issues
Energy	Growth of transportation means and motorized vehicles
	Electrification ratio
	New and renewable energy
Waste	Increasing volume at temporary and final disposal sites
	Open dumping at final disposal sites
IPPU	Growth of the processing industry
Agriculture	The need for agricultural lands, to develop food estate
	Use of inorganic fertilizers
	Increasing livestock
Forestry	Deforestation
	Critical lands
	Customary governance

Table 20.4 Subnational NDC Implementation strategy for Maluku province

Element of NDC Implementation	Maluku Province NDC Implementation Strategy
1. Mitigation	Established with reduction targets that are suited to local capacities, support international cooperation capacities, and use assumptions that synchronize local and national NDC contexts.
2. Adaptation and loss and damage	Guided by the national adaptation priorities (water, energy, food), and by the regulation of the minister of environment and Forestry P.33/2016 regarding guidance for the establishment of climate Change adaptation. Maluku province will focus on resilience in the capture fisheries, tourism, water, agriculture, forestry, marine transport, and disaster risk sectors.
3. Means of implementation (consisting of funding, technology, capacity-building)	For financing, the priorities will combine the funding programs from domestic, international, and the cost and incentives mechanism. For *capacity-building and technical needs assessment (*CBTNA), the national program will be translated to the provincial level.
4. MTV	MRV will follow the national guidance for MRV. There will also be a *subnational registry system* that integrates with the *National Registry System* (SRN).
5. Transparency framework	The framework is to be based on the *national communication* under the UNFCCC mandate and will encompass subnational *focal point program*, subnational *communication program*, as well as *Forest reference Emission level* (FREL) for the province. Also needed are the *National Stock-take and subnational* compliance.

Note: Numbers 1–4 are part of subnational NDC. The transparency framework stands on its own and is subdivided into subnational communication and subnational periodic development reporting

energy sector (354), forestry (142), waste (112), agriculture (67), and industrial process and production use (18) (Bassar & Impron, op cit.).

Capacity-building thereby involved state and nonparty stakeholders alike (refer to Table 20.5). A diversity of policy stakeholders was targeted, including civil servants, academia, youth, women, religious leaders, journalists, and vulnerable groups (RI, 2017). Between 2011 and 2017, capacity-building in Indonesia encompassed a wide range of development sectors, including energy, forestry, agriculture, cities, health, water resources, and tourism. Subnational capacity-building for climate change adaptation, including practical examples, has also been analyzed (Yoseph-Paulus & Hindmarsh, 2018). In an urban setting, strengthened capacity for spatial planning was deemed to be a strategic measure to realize low carbon and resilient cities.

Despite the notion that capacity-building measures in Indonesia have progressed from the national to subnational level, the experience and expertise are currently scattered and distributed among various ministries/agencies, the private sector, and CSO entities. A key necessity is to commission an appropriate proper gap analysis of the required capacities. Current initiatives have focused on needs assessments, but hard data needed for MRV are lacking. The dissemination of governance and coordination measures are yet to be increased, with logical implications for the Ministry of Environment and Forestry to take the lead in cooperation with the Paris Committee on Capacity-building.

Table 20.5 Notable capacity-building activities in Indonesia 2010–2017, mainly at the subnational level (inexhaustive list; Bassar & Impron, 2019)

Sector	Time	Proponent	Activities
General	2008	Private sector and media institutions	Popular campaigns on the prevention of global warming, for example, through the establishment of the green initiative forum (GIF), which is a joint measure by PT Unilever Indonesia Tbk. (Unilever), PT Pertamina (Persero), Kompas daily, female radio, and metro TV.
General	2010–2014	Dr Soetomo Pers institute (LPDS) in cooperation with the embassy of the kingdom of Norway	Journalistic training: for instance, LPDS has, since 2010, organized workshops on "Covering Climate Change" for national journalists, aiming to improve the knowledge of journalists, and at one stage the LPDS training received support from the mission of the embassy of Norway (2012–2014).
General	2011–2013	National Council for climate Change (DNPI)	Focus group discussions and coordination meetings to obtain inputs from stakeholders related to Indonesia's climate change policy and program, and participants were, among others, government officials, academicians, NGO activists, and youth.
General	2011–2014	The media agency Hijauku.com, established in 2011 as the first green portal in Indonesia	Organized Climate Change Classes (KPI) and Climate Change Training (PPI). It used social media, which currently reached 77,000 followers, and direct training action targeting users of social media, youth (high school students and university students) and the general public. During 2011–2014, the Climate Change Class succeeded in providing training on climate change to more than 600 participants in greater Jakarta with most participants being youth (Bassar & Impron, 2014).
General	2012	Joint crediting mechanism (JCM)	Capacity-building for joint crediting mechanism (JCM) implementation in Indonesia. The JCM is a bilateral cooperation between Indonesia and Japan for low carbon development implementation, which consists of capacity-building for central government, local government, project participants, private sector, and third-party entities from 2012 to the present.

(continued)

Table 20.5 (continued)

Sector	Time	Proponent	Activities
Agriculture; Fisheries and marine Affairs	2010–2011	Meteorological, climatological and geophysical Agency with the Indonesian Institute of Sciences, and Indonesia climate Change trust fund (ICCTF)	Built adaptation awareness, targeting fishing and coastal communities, using radio broadcasts, talk show, and other means for outreach.
Agriculture	2011–2014	Indonesia's meteorology, climatological and geophysical Agency (BMKG); ministry of agriculture	Development of the climate field school
Agriculture and food	2014	Ministry of Agriculture	Capacity-building was positioned as a cross-cutting issue that formed part of economic and sustainable development. An example was the "food smart village program".
Agriculture and food	2015–ongoing	Ministry of Planning – ICCTF	Resource mobilization (and training) for climate change mitigation and adaptation
Fisheries and marine affairs	2013	Ministry of Marine Affairs and Fisheries	Occasional adaptation in small islands
Public health sector, for vector-borne diseases (malaria and dengue)	2011	Ministry of Health	Mapping and adaptation strategies were developed; capacity-building materials were synchronized to the context of Indonesia as the largest archipelago in the world, characterized by a tropical climate.
Urban resilience	c. 2014	Cities (Semarang)	Cities have been active in the last 5–10 years, for example, *Diponegoro City action: Climate Change and urban Resilience* for Semarang.
Carbon market	2016	World Bank	Capacity-building for preparation for market readiness (PMR) implementation in Indonesia. The PMR is a cooperation between 15 developing countries with 17 developed countries that was managed by the World Bank for the international carbon market implementation. Indonesia as one of the developing countries that received a PMR grant also did many feasibility studies before and after its national operation in 2016.

20.3.8 Challenges and Opportunities

Capacity-building faced challenges such as policy and institution, and implementation of capacity building at the subnational level. There are also opportunities such as from climate finance, international cooperation.

20.3.9 Policy and Institutional Challenges

Effective policies and institutions were instrumental in building capacity on the ground. Consistency and effectiveness of regulations and fiscal transfer policies are essential for both national and subnational interventions. Rigid governance and the state financial system were among the main challenges. Policies, plans, and programs remain inflexible and nonresponsive in accommodating corrective actions to the process (Karuniasa, 2018a, b).

Changing energy policies indicate the challenge of establishing effective incentives. Energy purchasing tariffs and pricing, which were potential incentives, changed haphazardly and acted instead as a deterrent (Tilburg et al., 2016). By 2017, the feed-in tariffs for renewable energy were once again challenged when the government issued a policy (Energy and Mineral Resources Ministerial Regulation No. 50/2017 on renewable energy for electricity), which set the electricity price generated by renewable energy based on 85% of the local power generation cost. With a maximum price ceiling set at only 85% of the area's electricity supply cost (BPP), renewable energy project proponents found it difficult to apply for bank loans.

Capacity-building is also influenced by a combination of factors such as institutional arrangements and fiduciary standards. The two key policymakers, the Ministry of Planning and the Ministry of Finance, are yet to synchronize and synergize policies and activities. Further, access to international climate finance such as Green Climate Funds (e.g., Maulidia & Halimanjaya, 2014) was constrained by different fiduciary standards.[5]

Indonesia's nationally designated authority for the GCF, however, is gradually becoming operational. It took almost 3 years from the Minister of Finance's letter (*nomor S-882/MK.01/2015*) appointing the Chairman of the Fiscal Policy Agency (BKF) as the National Designated Authority (NDA) for the GCF, and the Director of the Center for Climate Change Financing and Multilateral Policy (PKPPIM) as the Executive Secretary of the Secretariat for the National Designated Authority, to issue a decree (*KMK 756/2017*), establishing the BKF as the NDA.

NDA capacity is being built and some of its functions are progressing:

1. Technical guidelines for accessing GCF funds are now available.

[5] Some of the national implementing entities were already accredited for access to GCF (PT SMI), and others were in progress (Kemitraan and PT IIF Indonesian Infrastructure Fund).

2. Interim draft standard operational procedures for the establishment of a No Objection Letter (NoL) have been issued.
3. NoLs have been issued for two project preparation facilities.
4. Information dissemination in the form of a website and roadshow has commenced.
5. A country-wide program to coordinate stakeholders has commenced.

20.3.10 Climate Finance Opportunities

For climate finance, there are four prerequisites: planning capabilities, access to financing, good governance, and cooperation with the private sector (Tänzler & Maulidia, 2013). Further, at the subnational level, considering the dynamics of the political economy and especially the formulation of subnational budgets (APBD), harmonization with medium-term planning is crucial to ensuring the progression of healthy fiscal transfers.

Capacity-building should be linked to the building of commitment and ownership. The latter is oriented toward practicalities such as greening investment plans. The Financial Services Authority has passed several policies and incentives such as regulations (P.51/2017 regarding sustainable financing), guidelines (green lending), training (for environmental auditors), and information dissemination (seminars and workshops including a Sustainable Banking Network Annual Meeting 2016 in Bali). Further, subject to approval by the Ministry of Finance and the Financial Services Authority,[6] commercial banks and the Government Services Agency (BLU) are encouraged to provide soft loans (e.g., for green buildings).[7] For example, Bank Negara Indonesia has gradually incorporated environmental conservation and rehabilitation into its soft loans for SMEs.[8]

There are also opportunities for investments and capacity-building. In the energy sector, national and provincial energy plans (RUED) can be reconciled. In the forestry sector— specifically the forest management unit—land and forest tenurial reforms increase the chances for sustainable forest management, ecosystem restoration, development of social forestry, and REDD+ at the subnational scale. An increase in the amount of blue carbon through restoration and conservation of mangroves and seagrasses (Alongi et al., 2015) is being considered, though it is yet to be captured at the subnational level.

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[6] The Financial Services Authority has issued regulation no 57/2017 mandating sustainable financing.

[7] The Presidential Regulation no 77/2018 regarding the management of environmental funds has provided the mandate for the establishment of an independent general services unit that provides grants, subsidies, loans, carbon funds, and a carbon market.

[8] https://www.edgebuildings.com/wp-content/uploads/2017/09/Indonesia-Green-Building-Market-Intelligence-EXPORT.pdf

Subject to the development of supportive regulations, there is also scope for enhancing the role of microfinance and insurance. Together with capacity development, they can support farmers' adaptations by providing high-quality products specifically targeted at the private sector (Budiman et al., 2013).

20.3.11 Subnational Level Capacity-Building Issues

It would be beneficial for at least one province to succeed in their capacity-building initiatives so that they could be an example to the other 34 provinces. Exemplary concepts from Maluku were to develop a bio-ecoregional approach to help conserve local biodiversity, and a community college to support local sustainable development with indigenous knowledge. These initiatives must be assessed for the potential larger-scale scenario[9] in Maluku Province and can be replicated in other provinces or circumstances after fine-tuning.

At the subnational level, certain local districts and municipalities are yet to develop an agenda and strategy for mitigation and adaptation. In one instance, Kupang, the capital of East Nusa Tenggara province, already has an inventory of its GHG emissions due to the national inventory system (SIGN-SMART), but the city is yet to produce development plans that are low-carbon and climate-resilient plans (Citraningrum, 2017; Ridwansyah et al., this volume).

The actual (and potential) roles of provincial banks are highly promising, especially since they have corporate social responsibility allocations that must be spent (IESR (Institute for Essential Services Reform), 2015; Imelda et al., 2017). The key issue is to support both banks and civil society in developing "bankable projects," including examples such as community investment for micro-hydro and biogas as part of renewables.

In practice, the support of subnational institutions may be enhanced by hands-on guidance from the central government. For instance, when the Director-General of Climate Change deployed experts to support REDD+ in the province of West Kalimantan, rules and regulations were effectively disseminated with the resultant gain in confidence by the local REDD+ working group. Similarly, the involvement of districts and villages from the planning stages was key to translating the REDD+ framework (including FREL/MRV and Safeguards REDD) in the field.

The integration of climate change adaptation and disaster risk reduction into subnational development plans is necessary and has been achieved by Maluku Province. This was part of the province's stated mission of implementing mitigation and adaptation plans to increase national and subnational development synergies to decrease GHG emissions and the disaster risk index. Neighboring southeast Asian countries have also suggested the integration of climate change adaptation and

[9] https://unfccc.int/news/new-toolkit-to-boost-capacity-building

disaster risk reduction plans and policies (e.g., Baybay & Hindmarsh, 2019; Forino et al., 2015; Lassa & Sembiring, 2017).

Of the many adaptation lessons, a common thread was the strategic potential of multistakeholder forums at subnational levels. In Kupang, the disaster risk reduction forum was deemed effective, and local actors now believe that a corporate social responsibility forum could go a long way in forging public–private partnerships (Conny Tiluata, personal communication).

Ultimately, participation is key to planning and implementation. Sufficient attention still needs to be paid to human rights, gender inclusiveness, and indigenous knowledge, which are crucial in maintaining justice through mitigation efforts (Haque et al., 2017).

20.3.12 International Cooperation and Tools

International technical cooperation is highly effective for capacity-building. For instance, key ministries have, with the help of development partners, voluntarily formulated and implemented a budget tagging system.[10] Budget tagging began in 2015 and was initially directed toward mitigation actions. For the period 2016–17, six key ministries (Environment and Forestry, Agriculture, Energy and Mineral Resources, Transport, Industry and Public Works, and Housing) tagged all outputs that contributed to (1) the reduction of GHG emissions, (2) the improvement in capacity to reduce GHG emissions, and (3) the stabilization and the conservation of carbon stocks. In 2018, budget tagging was extended to adaptation issues, thereby involving 17 ministries and agencies. Similarly, high-quality emission factors were calculated due to sound technical consensus reached concerning its format and data. The latter resulted from multistakeholder collaboration between the Ministry of Environment and Forestry and development partners (such as the Japan International Cooperation Agency, GIZ, and Flora Fauna International).

Indonesia's low carbon and resilient development plans are yet to accommodate proactive measures in using available toolkits and to translate these into the national language as needed. Many toolkits are available such as the Planning for NDC implementation: A Quick-Start Guide (CDKN, 2016); A guiding toolkit for climate change resilience (IUCN, 2014); and Community-based Risk Screening Tool – Adaptation and Livelihood (CIFOR, 2013). Best practices are also regularly revisited and it is now a foregone conclusion that web-based tools can assist with capacity-building (Khan, 2017).

[10] Budget tagging policy, Ministry of Finance Regulations Nos 136/2014; 143/2015; 163/2016 was mandated by the Presidential Regulation 612011 regarding National Action Plan for GHG emissions reduction.

20.4 Discussion

Capacity-building in Indonesia has begun to proliferate throughout many sectors, mostly at the national level. The synthesis of NDC implementation capabilities across the five mitigation sectors (energy, land, agriculture, waste, and IPPU) conducted by KLHK and GIZ (Bassar & Impron, 2019) provided a comprehensive baseline: (1) the geographic scope was mostly national; (2) service providers were predominately state institutions (instead of nonparty stakeholders); (3) capacity-building topics on the five sectors are deemed to already be oriented toward NDC; (4) the most frequent modalities for capacity-building are training, education, and technical guidance by national agencies; and (5) targeted groups and topics were aligned to appropriate sectors.

Initial observations suggested that capacity-building activities were driven mainly by international stakeholders, thereby appearing more political than practical (e.g., Putrawidjaja, 2008; Uy & Shaw, 2010; Yoseph-Paulus & Hindmarsh, 2018). However, this trend has gradually reversed in recent years (see Table 20.1 and Bassar & Impron, 2019).

Current activities span individual and organizational levels but are not yet been fully streamlined. For capacity-building to be transformational, effective enabling policies, economic incentives (and disincentives), and an accountability framework in which individuals, organizations, and systems operate, are required (Fig. 20.4).

Sporadic capacity-building activities are yet to be accurately measured. Although Indonesia already has its own National Registry System, it has ineffectively

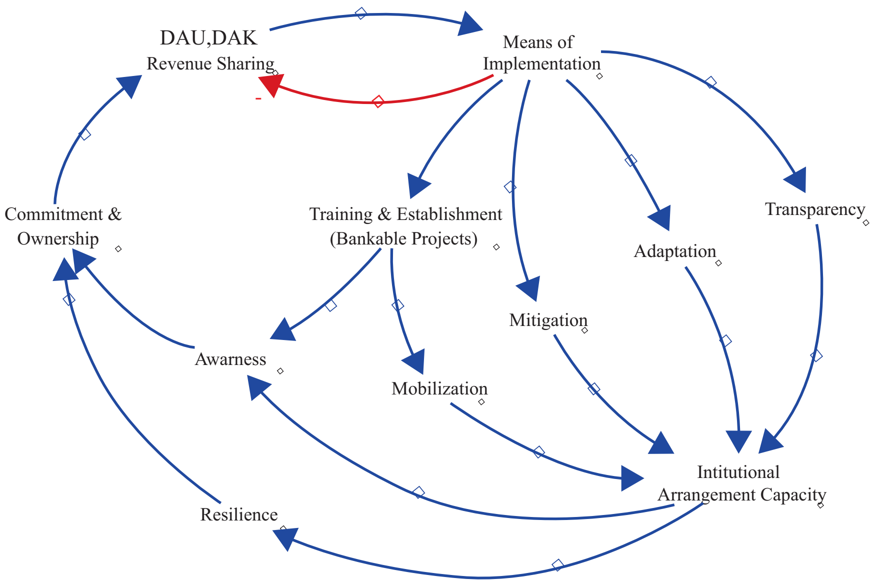


Fig. 20.4 Governing capacity-building

captured these activities and their impacts. These uncoordinated and unlisted activities, therefore, have failed to effectively contribute to the common (capacity-building) goal.

Capacity-building should take many forms, including technology, finance, MRV, institutional arrangements, and regulatory frameworks (extending as far as reformed fiduciary standards). Under institutional arrangements, which agency should lead capacity-building at the national level is yet to be determined. Thus far, the Ministry of Environment and Forestry and the Ministry of Energy and Mineral Resources have delivered the most initiatives. Policy documents can also refer to best practices from other localities and even internationally.

Subnational NDCs require sound practice and, therefore, for a single province to succeed, benchmarking against a successful region would also greatly benefit the building of capabilities in other provinces. This applies to the case of Maluku province, which established the first provincial-level road map for mitigation and adaptation, including CBTNA, although without detailing the framework to guide the delivery of capacity-building and practical responses.

Capacities must also be geared to investment plans. Climate financing support may originate from national, international, and (at least in theory) subnational level resources. However, currently, much of the climate finance depends on national block grants (DAU), special allocation funds (DAK), and revenue sharing. Mobilization of the crucial private sector will be enhanced should there be training on formulating bankable projects; for example, how to accurately calculate the costs and benefits of environmental services.

This study recommends a holistic and inclusive approach to the development of a roadmap, which must consider key mitigation and adaptation actions within multilayered governance, including the devolution of authorities and initiatives nationally, provincially, and by district or individual municipality. All these require effective needs assessments and mapping of progress. The key to meeting the common objective is to map out who is doing what and to ensure that GHG inventories are comprehensively and independently undertaken by each stakeholder. Therefore, in practice, commendable NPS initiatives that are implemented must be accompanied by standardized methods for taking GHG inventories. Subnational entities must also identify their specific objectives—such as the harmonization of provincial energy plans with an inventory of IPPU mitigation targets—and achievements at the national and subnational levels.

The time is ripe for institutionalizing capacity-building initiatives in Indonesia. With several agencies and organizations operating across different sectors, the required change-agents may emerge from a more dynamic civil society. For instance, Indonesia has the APIK Indonesia Network (National Association of Forestry and Climate Change Experts, with at least 168 member academics from all over the country). Assuming that local governments are more likely to heed the advice of their local universities and think-tanks, APIK with less bureaucracy has an effective span of influence. Therefore, institutions with the potential to exert effective decentralized influence are strong prospects to drive the required changes in national and subnational integration.

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References

Alongi, D. M., Murdiyarso, D., Fourqurean, J. W., Kauffman, J. B., Hutahaean, A., Crooks, S., Lovelock, C. E., et al. (2015). Indonesia's blue carbon: A globally significant and vulnerable sink for seagrass and mangrove carbon. *Wetlands Ecology and Management, 24*(1), 3–13. https://doi.org/10.1007/s11273-015-9446-y

Bassar, E., & Impron. (2014). *Indonesia National Strategy on.Article 6 of the United Nations Framework Convention on Climate Change (UNFCCC)*. DNPI-JICA.

Bassar, E., & Impron. (2019). *Report of development of preliminary capacity-building road map in relation to the implementation of Indonesia's first nationally determined contribution (NDC)*. KLHK-GIZ.

Baybay, C. S., & Hindmarsh, R. (2019). Resilience in the Philippines through effective community engagement. *Australian Journal of Emergency Management, 34*(1), 65–70.

Brinkerhoff, D. W., & Morgan, P. J. (2010). Capacity and capacity development: Coping with complexity. *Public Administration and Development, 30*(1), 2–10. https://doi.org/10.1002/pad.559

Budiman, I., Takama, T., Pratiwi, L., & Soeprastowo, E. (2013). Role of microfinance to support agricultural climate change adaptations in Indonesia: Encouraging private sector participation in climate finance. *Future of Food – Journal on Food Agriculture and Society, 4*(3), 55–68.

CDKN. (2016). *Planning for NDC implementation: A quick-start guide*. Climate and Development Knowledge Network.

CIFOR. (2013). *Community-based risk screening tool – Adaptation and livelihoods*. Center for International Forestry Research.

Citraningrum, H. M. (2017). *Study expose and discussion: Funding climate change responses in Kupang City*. http://www.iesr.or.id/2017/03/paparan-studi-dan-diskusi-pendanaan-perubahan-iklim-di-kota-kupang/ In Bahasa Indonesia Reform: Institute for Essential Services.

DJ PPI. (2016). *Buku Pintar NDC* [NDC guidebook]. (in Bahasa Indonesia). DG of Climate Change Responses, Ministry of Environment and Forestry – Republic of Indonesia.

EU and Republic of Indonesia. (2018). *EU – Indonesia blue book*. EU and Republic of Indonesia.

Forino, G., von Meding, J., & Brewer, G. J. (2015). A conceptual governance framework for climate change adaptation and disaster risk reduction integration. *International Journal of Disaster Risk Science, 6*(4), 372–384. https://doi.org/10.1007/s13753-015-0076-z

Haque, M., S. Haque, and S. Huq. (2017, November 2017). *Capacity-building day 2017: Initiatives that enhance the implementation of nationally determined contributions*. 1st Annual Event 16. http://www.icccad.net/wp-content/uploads/2018/02/Capacity-Building-Day-2017-Report.pdf. Germany Event [Report].

IESR (Institute for Essential Services Reform). (2015). *Funding climate change mitigation and adaptation in cities: The case of Kupang*. http://www.iesr.or.id/energypoverty/wp-content/uploads/2015/09/Workshop-cities-Kupang-9-September-2015-Indonesia.pdf. Workshop report.

Imelda, H., Kuswardono, T., & Tumiwa, F. (2017). *Climate change financing for cities in Indonesia. Case study: Kupang*. Institute for Essential Services Reform. https://reliefweb.int/sites/reliefweb.int/files/resources/Climate-change-financing-for-cities-in-Indonesia.pdf

IUCN. (2014). *A guiding toolkit for climate change resilience*. Int'l Union for the Conservation of Nature and Natural Resources.

Karuniasa, M. (2018a). *Peta jalan untuk mitigasi dan adaptasi perubahan iklim dan pembangunan berkelanjutan di propinsi Maluku*. [Road map for climate change mitigation and adaptation and sustainable development in Molucca Province]. *Bahasa Indonesia* [Working paper]. Universitas Indonesia.

Karuniasa, M. (2018b). *Capacity gaps and needs assessment at National Level* (Working paper to inform the PCCB's work on capacity-building needs and gaps). Universitas Indonesia.

Khan, M. R. (2017). Capacity-building for climate change: Lessons from other regimes. *Adaptation Watch Weekly Briefing*.

Lassa, J., & Sembiring, M. (2017). *NTS insight, no. IN17-01. Towards policy integration of disaster risk, climate adaptation, and development IN ASEAN: A baseline assessment*. RSIS Centre for Non-Traditional Security (NTS) Studies.

Le, T. H. P., Biesbroek, G. R., & Wals, A. E. J. (2017). The interplay between social learning and adaptive capacity in climate change adaptation: A systematic review. *NJAS – Wageningen. Journal of Life.*

Leitmann, J., Brown, T., Roesad, K., Bojo, J., & DeRidder, K. (2009). Investing in a more sustainable Indonesia: Country environmental analysis 2009. Washington, DC: World Bank. *Sciences, 82*, 1–9. https://doi.org/10.1016/j.njas.2017.05.00

Maulidia, M., & Halimanjaya, A. (2014). *Climate change coordination in Indonesia*. ODI.

Putra, R. A. S., Muluk, S., Salam, R., Untung, B., & Rahman, E. (2019). *Mengenalkan Skema Insentif Fiskal Berbasis Ekologi Di Indonesia: TAKE, TAPE dan TANE [introducing the scheme for ecological fiscal transfer in Indonesia: TAKE, TAPE and TANE (in Bahasa Indonesia)]*. Asia Foundation and UK Climate Change Unit.

Putrawidjaja, M. (2008). *Mapping climate education in Indonesia: Opportunities for development*. Climate Education Research-British Council Indonesia.

RI (Republic of Indonesia). (2016). *First nationally determined contribution*. Ministry of the Environment and Forestry.

RI (Republic of Indonesia). (2017). *Third National Communication under the United Nations framework convention on climate change*. Ministry of the Environment and Forestry.

Tänzler, D., & Maulidia, M. (2013). *Status of climate finance in Indonesia: Country assessment report, Strengthening Public and Private Climate Finance in Indonesia*. Final Report Funded by CDKN and Prepared by Adelphi and GIZ. http://cdkn.org/wp-content/uploads/2012/05/INDONESIA-Country-Report_3Dec2013.pdf

Tilburg, X., Santiago, V.-I., & Indriani, G. (2016). *Energy security as positive force for green growth in Indonesia?*

UNDP. (2009). *Capacity development – A UNDP primer*. United Nations Development Programme.

UNFCCC (United Framework Convention on Climate Change). (n.d.). https://unfccc.int/resource/bigpicture/index.html#content-capacity-building

Uy, N., & Shaw, R. (2010). Climate change adaptation in ASEAN: Actions and challenges. In R. Shaw, J. M. Pulhin, & J. J. Pereira (Eds.), *Climate change adaptation and disaster risk reduction: Issues and challenges* (pp. 349–368). Emerald Group.

WWF Indonesia. (2017). Buku Pedoman Penandaan Anggaran Hijau [Green Budget Tagging]. *di Daerah*. [Guidelines for Green Budget Tagging for the Subnational Levels]. World Wide Fund, 47 pp.

Yoseph-Paulus, R., & Hindmarsh, R. (2018). Addressing inadequacies of sectoral coordination and local capacity building in Indonesia for effective climate change adaptation. *Climate and Development, 10*(1), 35–48. https://doi.org/10.1080/17565529.2016.1184609

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Chapter 21
Strategy for Sustainable Urban Climate Mitigation: Kupang City Climate Risk Assessment

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Abstract Kupang City is one of the cities in Indonesia that is vulnerable to disasters caused by climate change, mainly prolonged dry season, strong winds, and increasing GHG emissions. These disasters will significantly affect all aspects of life, such as ecosystems, property, and infrastructure. This vulnerability is worsened by increasing urbanization, which creates additional risks for many people. This also can be explained by the growing number of motorized vehicles, which caused an increase in NO_2 (Nitrogen Dioxide). Data shows that a higher concentration of NO_2 was found on roadsides, amounting to 22,16 μg/m^3. Therefore, in this study, the geographical, demographic, and socioeconomic characteristics of Kupang City were analyzed to find the shortcomings and the challenges faced by Kupang City in order to implement policies related to climate risk reduction. This study aims to investigate the status of the current phenomenon by using descriptive design. Based on the literature analysis, it was found seven priority sectors, which considered able to resolve the disasters and challenges caused by climate change. The seven sectors are climate change adaptation and disaster risk reduction, water and sanitation, energy and transportation, solid waste management/municipal waste, sustainable use of resources, GHG emission inventory, and financing.

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Keywords Climate risk · GHG emissions · Kupang city · Risk reduction

21.1 Introduction

Kupang City is located along Kupang Bay in the northwestern part of Timor Island. The area is about 260.12 km^2, consisting of land (180.27 km^2) and sea (79.86 km^2). The ratio of land to water area in Kupang City is 5:2, which shows that Kupang City has a large coastal area directly bordering Kupang Bay), and many residents, therefore, interact with coastal and marine resources.

The terrain of Kupang City is relatively flat, the slope level varies between 0.15%, and the altitude is 0–300 m above mean sea level (AMSL). Therefore, it can be concluded that Kupang City is mainly a lowland area. The terrain of Kupang City is generally low elevation at in the north, gradually rising to the south. In the north, there are three subzones located along the coast including Alak (120 m. AMSL), Kota Lama (30 m. AMSL), and Kelapa Lima (50 m. AMSL). These areas are classified as areas vulnerable area to extreme weather, such as rising sea levels and strong winds. However, the lithology of Kupang City is dominated by limestone reefs, which are sufficient to withstand the prevalent rate of abrasion.

In terms of climatology, Kupang City is characterized as follows: (1) the rainy season lasts four months on average (March–October), while the dry season lasts four months (November–February); (2) in 2018, the average rainfall level was 1371.1 mm^3, while it was 1452.49 mm^3 for the entire NTT Province; (3) in 2018, there were 95 rainy days on average, while NTT Province as a whole had 96; and (4) the lowest temperature is 26.3 °C and the maximum is 39 °C, whereas the lowest temperature in NTT Province is 22.1 °C and the highest is 32 °C.

Kupang City often experiences extreme weather, such as rainfall beyond the normal frequency, or a shorter rainy season (Faqih et al., 2015). Extreme climate in Kupang City, with short rainy seasons, causes streams to dry up and well levels to drop (Kota Kita & UNDP-SCDRR, 2015). The tropical cyclones that threatened Kupang city tend to undoubtedly increase in frequency and intensity. Overall, it is projected that Kupang will experience more extreme dry seasons compared with the other places at East Nusa Tenggara.

21.2 Problems and Challenges

Typically cities in Indonesia, Kupang City are a destination for migration and urbanization of the population with educational and economic motivations. As the capital of the Province of East Nusa Tenggara (NTT), this city has several higher education institutions and economic activities that have attracted migration and urbanization, especially for young people who want to continue their education at a university or are simply looking for a better job. Currently, Kupang City has a

population density of 2.570,31 people/km^2, with a 2.9% annual population growth rate (Kupang City Central Agency of Statistics, 2021).

With the increasing population and their mobility, Suwari et al. (2020) found that there is an increase in GHG emissions such as NO2 (Nitrogen Dioxide) concentrations in Kupang City. The study showed that a higher concentration of NO_2 was found on roadsides, amounting on average to 22,16 μg/m^3. The increase in the number of vehicles causes traffic jams along some main roads and could be the major factor, which contribute to the higher NO_2 concentration. Moreover, mostly public transportations (angkot) are old and generate more emissions.

Imelda et al. (2017) agreed with Suwari et al. that the two primary sources of GHG emissions are energy (including transportation and power) and trash. Kupang's annual energy consumption has risen in tandem with the city's population and economy, both of which rely on energy. In Kupang, fossil fuels such as diesel and coal are generally used to generate power, while gasoline is used for transportation. Kupang also remains highly dependent on fossil fuels, notably kerosene, the most common cooking fuel.

Waste treatment in Kupang is still in open dumping pits. Kupang generates 382 m^3/day of municipal trash, of which only 268 m^3 can be disposed of in landfills (POKJA AMPL Kota Kupang, 2014). Sixty-seven percent of communities had not received appropriate waste management services (POKJA AMPL Kota Kupang, 2014), despite the fact that trash output is rising in tandem with population increase. Furthermore, the waste transportation fleet continues to be inefficient, resulting in rubbish that cannot be collected. According to POKJA AMPL Kota Kupang (2014), in 78.80% of local communities solid waste is not treated; 61.3% still burn their domestic waste. Medical waste is still disposed of at the final disposal site because there is inadequate incineration. There are not enough temporary disposal sites. Furthermore, local communities have yet to allocate property for the construction/location of temporary dump sites.

Disasters are increasing as a result of changes in the climate. During dry seasons with minimal rainfall, land fires are triggered in Kupang City. Drought becomes a regular occurrence throughout the dry season in Kupang. For purposes of comparison, The Meteorology, Climatology, and Geophysical Agency (https://en.wikipedia.org/wiki/Indonesian_language Badan Meteorologi, Klimatologi, dan Geofisika or BMKG) in 2020 reported that the location with the highest estimated rainfall is Cirebon City (West Java), while Kupang has the lowest rainfall. The average rainfall in Kupang in 2019 is 310 mm, while Cirebon has an average rainfall of ±2260 mm/year. Rainy days in Kupang City are considerably less frequent than in Cirebon. As a result, droughts are more likely in Kupang than in other cities such as Cirebon. This water situation in Kupang City will be directly impacted by climate change risk.

Most households in Kupang City have a water tank to keep water when the rain comes. Only 2% of the population drink mineral water from companies, while 24% of the population get the water from well. Some people buy water from companies for IDR 80.000–250.000 per 5 l (USD 5.57–17.40). Taking into account the minimum water consumption for cities with less than 1 million inhabitants is 150 l/day, then, buying water at the rate of IDR 80.000–250.000 (USD 5.57–17.40)/5 l is quite

a burden. Kota Kita (2015) has estimated that poor people spend around 20–50% of their income for water only (Theodolfi et al., 2015). In response to the increased population and greater levels of economic activity, water demand is also increasing. Besides the water crisis, a long dry season and low rainfall also cause the fire both houses and land.

Based on the report of Kupang City Health Department, there were 206 residents affected by Dengue Hemorrhagic Fever (DHF) during January to February 2020, with three persons dead. DHF disease attack in 2020 is still relatively low compared to the same period in 2019, which reached 400 cases. Maulafa subdistrict is the area with the highest DHF cases in Kupang City. The Indonesian Ministry of Health said the Extraordinary Event in the case of Dengue Hemorrhagic Fever (DHF) in East Nusa Tenggara in general was triggered by the problem of improper waste management.

The DHF has become a health problem for a long time in Kupang City, due to a lack of awareness of maintaining the cleanliness of the environment in residential areas, so that mosquitoes can easily live in the area and spread this dengue fever. The dengue mosquito lays its eggs in trapped water-filled, where this is usually found in rubbish that holds rainwater or any other water. Lack of awareness of maintaining cleanliness, some people refuse to sprinkle abate into the water reservoir because it will pollute the water to be consumed.

Another challenge for Kupang city aside of dry area is strong wind which come every year. This is because the air pressure of NTT is 1009–1012 Mb (BMKG, 2020). Such natural phenomenon will have a direct influence on shipping safety, food supply, property, tourism, and infrastructure, all of which will have an impact on people's lives, particularly in coastal areas.

The most vulnerable areas from increased sea level and the wave is three subdistricts where located on the coast, namely: Kelapa Lima, Kota Lama, and Alak. However, the closest area to sea level is Kota Lama, located 30 m AMSL; and has the highest population density (12.742 people/km^2). While, there are three subdistricts where territory is not located in the coastal area but often hit by strong winds, namely Kota Raja, Oebobo, and Maulafa.

21.3 Policy Direction, Recommendations, and Strategy

21.3.1 Kupang City Policy Directions

The Indonesian government has developed a national action plan to reduce greenhouse gas emissions (RAN-GRK) as well as a national action plan to adapt to climate change (RAN-API). The RAN-GRK was formalized through Presidential Decree No. 61/2011, which elaborates President Susilo Bambang Yudhoyono's emissions reduction pledge announced at the G20 meeting in Pittsburgh in 2009.

Unfortunately, RAD-GRK terminates at the provincial level in several provinces and ends at the district/city planning level in others. As a result, just a few cities in Indonesia have developed a strategy to minimize greenhouse gas emissions. Since Indonesia's national transfer system follows the program created by the appropriate district/city, mitigation and adaptation of climate change is not developed optimally due to limited budged condition.

Based on the midterm development policy document, RPJM Kupang City 2017–2022, seven strategies were applied by the local government to achieve the vision "Livable, Intelligent, Independent and Prosperous, with Corruption-Collusion-Nepotism Free Governance", specifically, (1) Controlling balanced urban growth; (2) Inclusive economic growth; (3) Encouraging creative economy businesses based on science and technology and environmental insight; (4) Smart City design; (5) Institutional and public management reforms; (6) Cooperation with other regions/countries; (7) Addressing major issues in the medium term (high priority). Many programs and activities can be considered as entry points to promote a climate resilience program for both mitigation and adaptation in Kupang City. Of particular note, is Mission 4: "To develop Kupang City according to an integrated Metropolitan and Environmental Strategy" (Fig. 21.1).

21.3.2 Recommendations and Strategy

The https://en.wikipedia.org/wiki/Indonesian_language BMKG, a Kupang-based institution, is in charge of monitoring natural disasters in the city. Additionally, there is BPBD (Badan Penanggulangan Bencana Daerah/Regional Disaster Management Agency), which is in charge of controlling potential regional catastrophes. According to the head of BPBD Kupang, Kupang has an early warning system but it is not operated optimally. Because BPBD works with BMKG, when a catastrophe warning is issued, BKMG sends an official warning letter to BPBD. The formal letter will then be processed by BPBD before being sent to the public via houses of worship, subdistricts, and the news media. Unfortunately, the Kupang administration lacks disaster warning equipment, despite the fact that the city of Kupang is particularly vulnerable to disasters as a result of climate change. Overall, Kupang City requires an integrated early warning system (IEWS) that incorporates strong warning and rapid reaction, resulting in reduced disaster-related deaths and economic losses, improving societal resilience and long-term development.

The Head of the Kupang City Environment and Sanitation Office also stated that waste processing is still done traditionally, due to a lack of funding. Kupang City's solid waste system has not yet transitioned to the use of a sanitary landfill system. Thus solid waste management takes up a huge amount of land. Household waste is disposed of at a makeshift rubbish dump, from where it is subsequently collected by waste management authorities in trucks and sent to open landfills. Improving energy networks should incorporate renewable and non-renewable energy sources, as well as generating energy sources for appropriate technologies. Based on this situation,

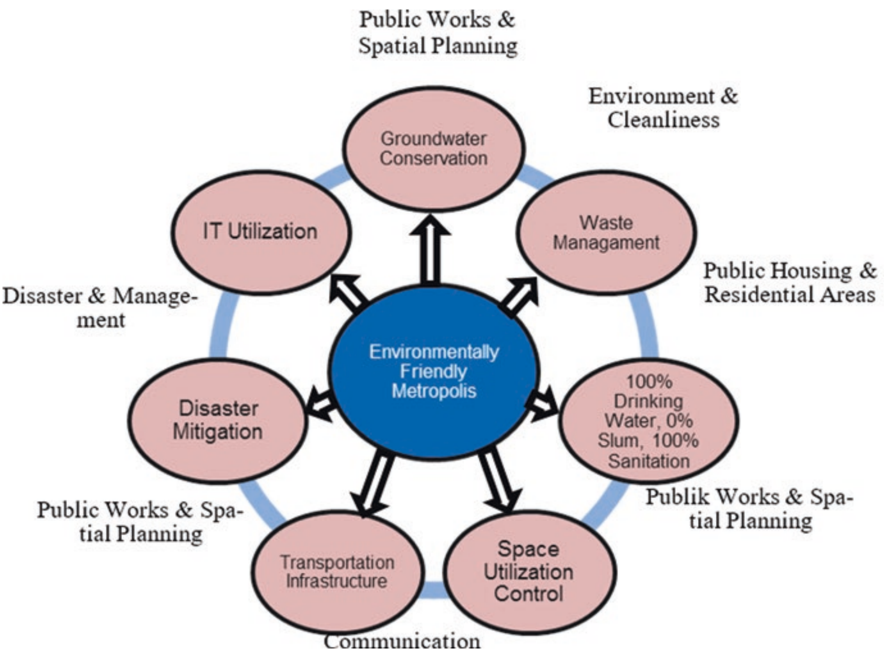


Fig. 21.1 The Integrated Metropolitan and Environmental Strategy of Kupang City. (Source: RPJMD of Kupang City, 2017–2022)

the authors suggest a set of recommendations and strategy, in line with the shortcomings and challenges that have been discussed with the stakeholders of Kupang. The strategic recommendations proposed are as follows (Table 21.1).

21.4 Conclusion

Kupang City is one of Indonesia's cities most vulnerable to climate change-related calamities including drought, rising sea levels, and windstorms. Such climate disaster risks have a direct negative influence on ecosystems, property, and infrastructure sustainability. These conditions affect people's lives, health, and safety in many harmful ways. What is more concerning is that climate change operates in negative synergy with other major developments, such as urbanization, creating extra hazards and vulnerabilities for many people. The most critical problems faced by Kota Kupang are tropical winds and acute dry seasons. Furthermore, Kupang still lacks adequate handling of waste streams, water and sanitation, as well as GHG emissions. In sum, we have developed a set of recommendations that are tailor-made for the improvement of Kupang City taking into account its special local circumstances.

Table 21.1 Recommendations for priority sectors

No.	Recommendations for priority sectors	
1.	*Climate Change Adaptation & Disaster Risk Reduction (CCA & DRR)*	
	Policy & Regulations	Accelerate a revision of the Local Regulation (Perda) on the Spatial Planning of Kupang City especially to address increased migration and urbanization.
		Issue regulations (mayoral decisions) to regulate climate change adaptation and mitigation.
		Legalize the working group (Mayoral Decision) for CRIC Program.
	Programmatic & Development Project	Facilitate and build a platform of multistakeholders to support the local government for implementing CRIC.
		Facilitate the local government for improvement of future infrastructure and house and residential planning.
		Facilitate to control the establishment of tourism facilities and houses in coastal areas.
		Facilitate the improvement of hospitals in all of the subdistricts as an effort to anticipate and reduce the health impact of the climate crisis.
		Provide technical inputs for developing a protection strategy of the most vulnerable groups.
		Mainstream DRR into Community-Driven Development by adopting and scaling up an element of resilience.
		Facilitate developing an integrated EWS.
		Provide technical inputs for the improvement of houses and settlement zones to reduce the impact of strong wind.
	Capacity Building	Action learning about various instruments for planning and implementing adaptation and mitigation actions, including in the development of spatial planning and other climate-resilient and inclusive policies.
		Action learning about the formulation of proposals for mitigation of natural disasters due to climate change; through cooperation with various parties both at the national and international levels.
		Action learning to maximize the utilization of data and information provided by BMKG to inform the community about information related to climate. This can be coordinated with local BPBD to help make people aware of potential future hazards.
		Disseminate information to the community about vulnerable places in the city.
		Action learning to government officers to promote a house and settlement design to mitigate the risk of the strong wind.
		Strengthen groups of community members so that they may help disseminate ideas about climate change adaptation.

(continued)

Table 21.1 (continued)

No.	Recommendations for priority sectors	
2.	*Water and Sanitation*	
	Policy & Regulations	Facilitate to improve the Regional Regulation (Perda) at the Provincial level on water supply management; Infrastructure strategic plan.
	Programmatic & Development Project	Provide technical inputs for developing a master plan for clean water and sanitation to know the length of the water distribution network.
		Provide technical inputs for developing the master plan on the city's drainage.
		Provide technical inputs to build a dam in Baumata, located in Kupang Regency.
		Facilitate development of water resources service systems to meet the needs of clean water services while still paying attention to soil and water conservation efforts.
	Capacity Building	Training for government officers, on improving the quality of service of PDAM (locally owned company for drinking water).
		Action learning about maintaining a clean environment free of garbage that otherwise accumulates and inhibits water flow, becomes a nest for mosquito larvae, leading to the spread of Dengue Hemorrhagic fever (DHF).
3.	*Energy and Transportation*	
	Policy & Regulations	Local Regulation (Perda) on Public Transportation Management.
	Programmatic & Development Project	Provide technical inputs for developing the Master Plan for the use of solar energy in Kupang City.
		Provide technical assistance for developing a public transportation system consisting of public transportation within cities, between cities and subdistricts.
		Facilitate to encourage the development of telecommunications infrastructure in underserved areas and new development areas.
4.	*Solid Waste Management/Municipal Waste*	
	Programmatic & Development Project	Provide technical inputs for developing sanitary landfill waste management.
	Capacity Building	Action learning to promote solid Waste Management – through community participation in Waste Management, the use of Appropriate Technology, and optimizing the Final Disposal Site.
		Increase public awareness to reduce plastic waste.
5.	*Sustainable Use of Resources*	
	Programmatic & Development Project	Facilitate to implement the Mayor Regulation Number 33 of 2019 to limit the use of plastic bags as a government effort to reduce the volume of plastic waste in Kupang City, particularly in the business sector.
	Capacity Building	Action learning for communities to promote the use of Appropriate Technology and optimizing Final Disposal Site.

(continued)

Table 21.1 (continued)

No.	Recommendations for priority sectors	
6.	*GHG Emission Inventory*	
	Policy & Regulations	Mayoral decisions on database management on GHG emission inventory using information technology.
	Programmatic & Development Project	Facilitate the preparation of a dashboard for a database system on GHG emission inventory using information systems.
		Facilitate development of an action plan to cope with the impact of climate change and management strategy to reduce greenhouse gas emissions.
	Capacity Building	Provide training to government officers on how to calculate GHG emissions, and how to operate the information system.
7.	*Financing*	
	Programmatic & Development Project	Facilitate the local government in the advancing fiscal transfer mechanisms from Province to District Level (TAPE) and from District to sub-district and village level (TAKE), and access to international transfers including GCF, GEF, Adaptation Funds.
		Facilitate boosting the private sector in implementing low carbon investment/business practices in two main areas (water and waste management).
		Facilitate for coordinating to CSR forum to utilize the CSR fund for emission reduction program.

References

Central Agency of Statistics. (2021). *Total of population*. Kupang City Central Agency of Statistics.

Faqih, A., Jadmiko, D. J., & Geru, A. S. (2015). *Keragaman dan Perubahan Iklim Nusa Tenggara Timur*. UNDP-SPARC Project. Kementerian Lingkungan Hidup dan Kehutanan.

Imelda, et al. (2017). *A case study climate change financing for cities in Indonesia*.

Kota Kita. (2015). *Urban climate risk management plan, City of Kupang*.

Public Works Office. (2014). Strategi Sanitasi Kota Kupang Provinsi Nusa Tenggara Timur. *Pokja AMPL Kota Kupang Tahun 2014*. https://sippa.ciptakarya.pu.go.id/sippa_online/ws_file/dokumen_usulan/ssk/SSK_Kota_Kupang.pdf

Suwari, et al. (2020). *Environmental health risk assessment of nitrogen dioxide exposure to ambient air pollution in Kupang city*. https://www.granthaalayahpublication.org/ journals/index.php/granthaalayah/article/view/IJRG20_B07_3510/483

Theodolfi, et al. (2015). *Analysis of clean water needs in Kupang City according to the availability of clean water sources and services*. Department of Environmental Health Poltekkes Kupang Health Ministry.

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Chapter 22
Local Resource Governance: Strategies for Adapting to Change

Skye Turner-Walker

Abstract Climate change is significantly impacting local communities throughout Indonesia that are dependent on access to ecosystems and weather-dependent resources. This chapter explores how local resource governance systems shape responsiveness and adaptive capacity of communities to pressures and change. Drawing on two comparative cases studies of coastal communities in Indonesia, this chapter conveys how active responses to environmental pressures and change over resource and land conflict, are indicative of adaptive capacity and how communities are likely to adapt to climate change impacts. The chapter argues through illustrative examples that local resource governance determines innovation and engagement through collective handling, reciprocity, cooperation and coordinated action, in order to adjust and adapt in dealing with environmental pressures, elite capture, conflict and change.

Keywords Coastal · Environmental · Local resource · Governance

22.1 Introduction

Understanding the ways local communities can govern, innovate, and engage adaptation strategies to deal with environmental stresses and change, including climate, is crucial knowledge for Indonesia, as the impacts of climate change in Indonesia, combined with other disaster types, continue to rise (Djalante, 2018; EMDAT, 2020). This chapter, therefore, presents a case study perspective on local ways of governing, innovating, and engaging adaptation strategies at local community

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levels. Based on a comparative study of two cases in Java and Maluku of rural coastal areas, the chapter documents ongoing local resource governance processes adopted by local communities in adapting to land-use pressures and environmental change. The first case study takes place in the conjoined villages of Haruku and Sameth on Haruku Island, in Central Maluku. Here, both customary land and marine management are practiced (known in the region as *Sasi*) for marine, agroforestry and agricultural livelihoods. The second case study takes place in the Karangsewu and Bugel villages of Kulon Progo, Yogyakarta, in Java[1] where residents have transformed the coastal sand plains from marginal non-productive arid land, to productive agriculture with some of the highest yielding chili crops in Indonesia.

The sites selected for this study were chosen based on indicative earlier studies and preliminary discussions within the communities selected. These noted the roles that collective resource governance and innovation have played in both communities, in strategies actively tackling other (nonclimate) types of social and environmental pressures and change, thereby also propelling responses to climate change. The selected sites rate as highly vulnerable to climate impacts but rank as having high social resilience among studies (Batiran & Salim, 2020; Gaspersz & Saiya, 2019; Hallatu et al., 2020; Mony et al., 2017; Supriyanto et al., 2012). Both case sites report that their active resilience came through local agency, self-determination, and collective action, driving adaptive capacity to respond to change. Each case has overcome resource governance pressures and conflicts over land or marine areas and resources, with resource extraction pressures being typical between both. A comparative case study approach was adopted specifically in order to understand the diverse social actors and practices at play in these settings, and their responses to broader political, social, cultural, economic, and environmental drivers (Bartlett & Vavrus, 2016) as well as how motivations and levels of influence work together (Bourdieu, 1977; Giddens, 1984).

Individual and group semistructured interviews were undertaken during 2019 and 2020, in each of the two sites. In the first site, these interviews were conducted in Indonesian language with Ambon and Haruku dialects (from Maluku), and in the second site, interviews were conducted mixed in Javanese and Indonesian languages. The interviews were transcribed and translated to English,[2] and then coded using a grounded theory approach to develop themes from the data collected. The grounded theory allows for the coding of cases for conceptual development in generating theories of process, sequence and change in social interactions, organization, and roles (Glaser & Strauss, 1987). Grounded theory was therefore selected for the research methodology given that it compliments case study usage, allowing work through a continuous inductive interplay between data collection and analysis to discover themes (Martin & Turner, 1986; Myers, 2009).

[1] The Daerah Istimewah Yogyakarta (DIY) is a Special Administrative District since 1945, headed by a Sultanate.

[2] Where verbatim quotes are included in this article, these are translated from either Javanese or Indonesian languages, and Ambon or Haruku dialects, with some variation in the interpretations.

22.2 Climate Change as Part of a Complex Array of Social-Environmental Pressures

Throughout the world, impacts and extreme events stemming from climate change significantly affect climate-dependent activities such as those based on agriculture, fishing, and natural-resource-dependent livelihoods (Dodman et al., 2014). At the same time, climate change disproportionately affects rural and natural resource-dependent populations and the rural poor (Dasgupta et al., 2014). Many rural and natural resource-dependent communities face long-term factors such as land degradation and conversion, along with issues around access, governance and conflict that predate or are unrelated to climate change (Ireland & McKinnon, 2013). Climate change serves to exacerbate these existing context-specific factors and inequalities at the local level (Ayers, 2010), with climate change compounding other factors pertinent to rural areas, such as a lack of access (compared with urban areas) to services, infrastructure, investment, inputs into decision-making and information (Dodman et al., 2014).

For rural and natural resource-based populations in Java and Maluku, alongside rapid economic and population growth, Indonesia's disparity between rich and poor has grown faster than in any other country in Southeast Asia (Gibson et al., 2017) having the sixth-worst socioeconomic discrepancy of any nation globally (Gibson et al., 2017). Around 9.5% of the total population in Indonesia were living below the poverty line in 2019,[3] which translates into around 26.42 million people out of Indonesia's 270.2 million population (World Bank, 2020). A majority of this figure is the 15 million (or 53.45%) of Indonesia's poor living on the island of Java (BPS, 2016). While conversely, in the islands of Maluku with a significantly smaller population than Java, 22% of the area's population lives below the poverty line, making Maluku the region with the highest percentage of poverty per capita (BPS, 2016). The livelihood sources of the majority of people in both areas are small-scale farming, fishing, and trade work (BPS, 2020). Markedly, in each region, rural farmers and indigenous groups also disproportionately represent Indonesia's poor (BPS, 2020). Leveraging on these context-specific factors, and exacerbating inequalities at the local level, climate change has had significant impacts in both case studies in Java and Maluku.

In both case studies, climate change has reportedly resulted in coastal inundation, increased storms and winds, floods and flash floods, increased heat and periods of heat (increasing labor requirements for watering and changes to watering timings), rain variability, as well as increased and new pest incidence, and accompanying crop and yield loss. Climate change has also affected the traditional

[3] It should be distinguished that the poverty line defined by the Indonesian government is substantially lower than other measures (e.g., the World Bank poverty line uses US$1.25 daily rate). In 2016, the Government of Indonesia defined the national poverty line as a monthly per capita income of IDR354, 386 (equivalent to US$26). This is much lower than poverty lines applied globally. Using global indicators, the rate is much higher.

usage of agricultural and fishing calendars and the ecosystem signaling that communities have relied upon for generations to manage land and natural resources, as well as the livelihoods dependent on these. In Maluku, for example, climate change has significantly affected the ocean currents, influencing fish patterns and the timing of fish cycles. Impacts from climate change have compounded in both cases with the ongoing conflicts and environmental pressures faced by the local communities in each. Residents in both case studies have continuously responded by adapting to climate change among other pressures and change types through collective local resource governance mechanisms over years.

Combining with the rising impacts of climate change, issues over land governance continually emerge to keep local communities that are dependent on natural resources and land access subject to ongoing environmental pressure and change. Rural (and indigenous) communities in Indonesia dependent on natural resources and land access, hold access to these under varied, yet tentative rights. Accordingly, vulnerabilities exist alongside increasingly complex cross-scale relationships between communities and globalized forces culminating amidst other challenges and with socio-economic disparity playing out in the ways that populations have control over, or access to, natural resources and land use. How this translates into land access and governance is problematic as fierce competition over land as a commodity expands. Land conflict, for example, is a prominent feature across Indonesia. Conflict continues to arise alongside ongoing pressures on resources and access to land, with the demand for both surging. The number of active land conflicts throughout Indonesia has continued steadily to increase, most frequently occurring in rural areas where livelihoods depend on managing land resources (Handoko et al., 2019).[4]

Rural (and indigenous) communities in Indonesia that are dependent on natural resources and land access often hold access under tentative rights because in practice, legal use is often difficult for rural and indigenous populations to assert. The pressure for individual land titles and competing interests continues between the acquisition of land under corporate entities and increasing commercialization of land (McCarthy & Robinson, 2016) and alongside state land (re)acquisitions. Land conflicts being widespread throughout Indonesia are also due in part to discrepancies between legal use and actual use, and the ability of the rural poor and indigenous people to access rights and legal justice. Immense divergences between formal land-use allocation and ownership within the state registration system and the actual land-use situation in practice (McCarthy, 2017) determine access to land and natural resources and with economic disparity playing out in the ways that populations have control over, or access to, natural resources and land use. These complexities force communities at local levels in rural areas toward collective action on knowledge, policy, and practice (Warren & McCarthy, 2009). Hence, rural communities' resilience also mediates rural areas' vulnerability to climate change, such as indigenous knowledge and networks of mutual support (Dodman et al., 2014).

[4]The Consortium for Agrarian Reform, for example, noted that for 2017, as many as 659 active agrarian conflicts were disputing a total land size area as large as 520,491.87 acres and including at least 652,738 households (Handoko et al., 2019).

22.3 Climate Change Adaptive Capacity and Governance Responses to Pressure and Change

Adaptive capacity is defined by the IPCC as “the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” (IPCC, 2022). Adaptive capacity is often explicitly emphasized by the two sides to adaptation in either proactive or reactive responses to impacts (Adger et al., 2007; Ford et al., 2013; Gallopín, 2006; Hill & Engle, 2013; Hinkel, 2011; Nelson et al., 2007). Reactive responses are responses made rapidly to respond with prompt innovations or reactive transformations to minimize the damage from specific events in the short term and long term, whereas proactive responses represent long-term strategized processes that integrate new information as it manifests (Hill & Engle, 2013). A fundamental part of proactive responses is considered to be the active involvement of the individual, community, or society involved in the process. Adaptive capacity is not static, nor is adaptive capacity evenly distributed within populations or communities themselves (Berkes et al., 2008; Walker et al., 2004). In turn, making climate change part of a complex array of social-environmental pressures to which rural (and Indigenous) communities seek to cope and adapt. The literature on climate change adaptation contends that the reciprocal and social relations commonly found in agrarian societies are critical for dealing with hardships like climate change impacts and disasters (Adger, 2003a, b; Pelling, 1999; Ribot et al., 1996). Thereby implying that not only do agrarian and natural-resource dependent communities tend to face greater impacts and disparate vulnerabilities to climate change, but they also hold the social qualities and adaptive capacity to respond to climate change. As key examples, communities in the two case studies employ their own local resource governance systems, based on traditional and collective models. Though there is variation between the approaches in the two regions, including in the formal governance and local-level institutions.

If complex governance systems provide a combination of purposeful collective action and emergent phenomena resulting from self-organization processes and agency among a range of actors (Grecksch & Klöck, 2020), then local and customary institutions in Indonesia are a good example of these. They often provide structure and foster trust and norms of reciprocity for cooperation and coordinated actions, which are deeply tied to local notions of identity and social norms of cooperation (Dahal & Adhikari, 2008). *Adat* describes customary systems and people, encompassing most angles of life. The term has come to refer to the collective identity of various indigenous practices under the umbrella of custom (van Engelenhoven, 2021). From legal, religious, moral, political, and cultural aspects through to governing individual behaviors, to how families relate and the interrelations and intrarelations of the community and community members (Davidson & Henley, 2007). *Adat* prescribes a system of relation between people and the environment, covering most aspects of resource management (social, economic, and environmental)

(Tyson, 2010). *Adat* conversely holds many meanings according to the context in which it sits. Used within and across communities to form collective management for local resources, *Adat* persists widely across Indonesia, determining local resource governance practices (Tyson, 2010).

Throughout Indonesia, alongside the customary institutions providing structure and fostering norms of reciprocity for cooperation and coordinated action, other examples of reciprocal and social relations can be found that are applicable to adaptative capacity. For example, G*otong royong,* or collective action (Anwar et al., 2017) forms three tiers of community obligations alongside *musyawarah* (consensus; technically the basis for legislative decision-making) and *koperasi* (cooperatives; constitutionally the basis of the economy). These three socio-cultural forms of local governance or mutual assistance at the village level are also vital to adaptive capacity, remaining widespread and deeply rooted culturally (Bowen, 1986). G*otong royong*, for example, has been widely associated in Indonesia's disaster risk reduction and socio-cultural identity literature, as a key form of social capital interchangeable with resilience and adaptive capacity in a number of studies (Bowen, 1986; Ha, 2010; Kusumawardhani, 2014; Lukiyanto & Wijayaningtyas, 2020; Mardiasmo & Barnes, 2015; Slikkerveer, 2019; Suwignyo, 2019). *Gotong royong* refers to the principle of neighbors helping each other without the promise of anything in return (reciprocity) (Anwar et al., 2017). *Gotong royong* is considered mutual assistance, although the applications are varied and involve ideas mixed between obligation and the practice of reciprocity (Bowen, 1986). Common examples of applications are environmental protection or collaboration of local residents working together, volunteering to help neighbors and reconstructing local roads or village infrastructure (Anwar et al., 2017; Kusumawardhani, 2014). These forms of mutual exchange are also key to enacting collective responses and engaging the social relations and reciprocity needed for dealing with hardships such as climate change alike. These elements also form the basis for formal governance institutions such as *Musrenbang,* which is an amalgamation of *Musyawarah Perencanaan Pembangunan*. *Musyawarah* means communities coming together to resolve conflicts peacefully (rule by consensus), and *Perencanaan Pembangunan* means development planning (Sindre, 2012) to decide community priorities (Idajati et al., 2016). *Musrenbang* foundations, for example, are built on the tradition of community organizing in Indonesia that combines notions of traditional conflict resolution mechanisms for development planning, with multistakeholder consultation forums meant to encourage and promote community participation (Sindre, 2012).

These local traditional governance systems and structures were incorporated during the post-Suharto revision of national and local institutions in Indonesia. Legislation was altered to provide more access to village communities by utilizing traditional local systems of governance, to play a role within the planning and development that concerns them. In *Adat* areas, such as Maluku, a local governance

configuration imported from the structure in Java[5] had previously forced village administrations to incorporate the government system established under the Javanese regional and village government style throughout Indonesia. During the Suharto period, this amalgamation of the local governance system effectively disconnected the various customs and converged the diverse systems and mechanisms of authority held over natural resources (Batiran & Salim, 2020). Following the collapse of the New Order, as attempts to make planning more participatory were made (Purba, 2011), the role and function of the administrative system shifted toward a community, bottom-up direction. Greater local participation in decision making was supposed to be achieved in order to re-democratize processes and guarantee rights to land and resources for Indonesian civilians (Warren & McCarthy, 2009). Institutions (e.g., *ronda*, the community-neighborhood security system, or *kerja bakti*, a form of neighborhood social service) that had been previously utlized under Suharto to mobilize communities, instead reinterpreted, reappropriated, and redirected toward community purposes (Wilhelm, 2011). These changes repivoted local governance toward traditional systems intended to promote decentralization. While at the same time, this decentralization sought to overturn the nation-state approach to applying a uniform local governance model across the Indonesian archipelago that had been taken during the New Order period, which had erased cultural and geographically specific traditional governance institutions with varying success (Bebbington et al., 2006).

[5] In rural village settings in Java, the responsibility for the community falls predominately to the RT, RW, *Dukuh*, and *Kelurahan* institutions. While farmers in the Java case study have formed their own clusters for governing local resources relating to farming between them, which overlaps between the RT and RW levels, as well as taking in the cooperative and alliances formed between coastal farmers. Formally, each cluster of 50–80 households is broken into the formal institution of *rukun tetengga* (RT) (Simarmata et al., 2013). *Rukun tetengga* roughly translates as "neighborhood association." Each *rukun tetengga*, or RT, holds a formal leader. The RT unit and its appointed head (elected via a process of voting, by each registered resident), then, sit under the larger grouping of *rukun warga* (RW). In areas where there is no longer the appointed RW grouping, the RT grouping sits directly under the *Dukuh* (the equivalent of a hamlet), and its (elected) appointed head. *Rukun warga* (RW) is a division of territory in Indonesia below the *Dusun* or *Lingkungan*. *Rukun warga* is not included as a division of government administration, and its formation is passed through a community meeting of citizens, in the same process for the RT grouping. This unit consists of several RT groupings and their heads. RT and RW institutions tend to be more engaged within community life and have an administrative function in forming the neighborhood (Yuliastuti et al., 2015). In general, however, the functions of RT and RW are not just related with the kinship of community. The RT and RW groupings coordinate community activities and bridge the relationship between village communities and the government (in this case is the *Kelurahan* or sub-district). In other words, structurally RT and RW are the lower administrative organizations dealing directly with the public. RT organizations have a strategic role in relation to community social activities, and in linking administrative affairs and social issues (Yuliastuti et al., 2015). The next unit grouping level up is the *Kelurahan*, which comprises of several *Dukuh* and RW groups. From *Kelurahan* sits the *Kabupaten*, the *Kecamatan* and then a mayor. With non-elected, government appointed heads, these then feed up to the provincial and national governments (Simarmata et al., 2013). The *Kelurahan* operate as the smaller instrument of *Kabupatens*, *Kotamadya*, or *Kota administrasi*, below the *Kecamatan* level. In terms of formal government administrations, the *Kelurahan* is the smallest organizational unit and the closest government administration institution to village community life (Yuliastuti et al., 2015).

Community level governance was released from various regulations (and supervisions) post-Suharto, enabling a return to the practice of local customs within customary institutions, as local village-level institutions across Indonesia moved to combine formal and informal institutions. At local levels, these integrate with traditional systems of governance. In Haruku, for example, a hybrid system operates that includes national formal institutions, and also the local institutions of *Negeri* (the name in Maluku for village country, lands, or customary territory) and *Sasi* customary governance among aspects of the national system. *Sasi* is the customary law found throughout *adat* areas in Maluku, which enforces terms of governance and protection of natural resources guarding ecosystems through regulations, boundary controls, allocations of sustainable use periods or protection time period controls (Mantjoro, 1996; Soselisa, 2019).

22.4 Local Governance: Driving Adaptive Capacity Through Collective Response to Environmental Pressures, Conflict, and Change

Complex pressures facing rural areas in accessing and managing natural resource-based livelihoods force innovative collective action (Warren & McCarthy, 2009) mediating rural communities' vulnerability to climate change and resilience (Dodman et al., 2014). Hence, collective management of natural resources has been crucial to sustaining lives and livelihoods on an ongoing basis, and in resilience of ever-present environmental pressures and threats. At the same time, for these reasons, the collective handling of environmental risks, pressures, and local governance of natural resources are considered crucial in addressing climate change impacts (Adger, 2003b). Widely throughout Indonesia, local communities, such as in Haruku and Kulon Progo, have been responding and adapting to ongoing and rapid environmental change and pressures for decades, utilizing collective approaches to local resource governance that are adaptive. One key exemplar being the role that the indigenous and agrarian movements, found widely throughout Indonesia, have played in securing access to land, locally determining resource governance through advocacy and various campaigns (Peluso et al., 2008). As part of ensuring access to resources, the emergence of a legitimizing discourse that has recurrently stressed environmental stewardship, cultural identification and attachment to place, has often formed part of securing land and resource (and thereby livelihood) access (Hall et al., 2011). For instance, through the use of indigeneity in asserting rights toward and the capacity to govern forest areas (Hall et al., 2011).

Legitimization plays a central role in collective mobilizations (Hall et al., 2011), allowing people to position themselves to acquire rights or resources (Karlsson, 2003; Li, 1996, 1999). Claims to land rights were increasingly made in the form of appealing to collective *Adat* rights following the fall of the New Order, with the rapid rise of social movements recognizing indigenous community and *Adat* rights (Muur, 2018; Muur et al., 2019). *Masyarakat Hukum Adat* (customary community

law) can be proven as a claim to territories by linage as well as by those actively living under customary institutions and traditions[6] (Bedner, 2016). Hence a resurgence of *Adat* local customary institutions (Davidson & Henley, 2007) arose, both in proliferation and the strength of customary *Adat* groups, alongside (local) non-government organizations, and ad-hoc community groups (Warren & McCarthy, 2009) to overcome discrepancies in land access and ownership. Agrarian movements also became more frequent as a path for autonomy and access to local government (Lund & Rachman, 2016). In this way, communities such as in Haruku and Kulon Progo, have been countering land pressures and conflicts, and exhibiting advocacy of their own resilience and agency by enhancing their access to resources (Li, 1996, 1999; Lund & Saito-Jensen, 2013; Platteau, 2004; Platteau & Abraham, 2002; Ribot, 2007).

This advocacy for legitimacy and rights of access to land (and marine) resources, has been routinely evident over decades in both case study contexts, as part of enabling and guarding community resilience in a number of ways. In Haruku, the *Kewang* as a customary institution have a long-running history of involvement and continue to be involved with government, non-government and civil organizations for advocacy on the role of customary governance and rights. In the lead up to the Maluku conflict (often referred to as the Maluku wars[7]), Haruku faced environmental and resource access pressures. A large Indonesian mining company with foreign investment and backing from the central government (Batiran & Salim, 2020), secured state permits for gold mining exploration in the upper catchment areas of Learisa Kayeli River of *Negeri* Haruku. The exploration resulted in damage to parts of the upper river area of *Negeri* Haruku with flow-on consequences to the lower estuary. Traditional fish breeding grounds were damaged, while mining operations on the mountain rendered the river and drinking water supplies unpotable, and customary *Adat* practices (*Sasi lompa*) were forced to cease with the loss of the ecological systems. "They dug it up, they drilled it ... the soil became white like coconut milk. When they dug on the riverbank, it [tailings] were carried into the river and drifted down. Without knowing, the people here and below who use the water and the *lompa* fish were affected. *Sasi lompa* could not be held." The infringements on *Sasi* managed area, spurred collective action and a resilient response from Haruku residents under the stronghold of the *Kewang,* who together put up substantial resistance. By aligning themselves with broader indigenous and environmental rights advocates, residents were able to draw on networks of support and alignment, and the local community was able to advocate their own resilience and agency in retaining access to their customary lands and resources. Closely aligned with a tight support network, they succeeded in ceasing the operations and damage being done to the water catchment and estuary under the mining exploration (Batiran & Salim, 2020). By pooling resources, residents were able to draw on the support of networks from indigenous peoples movements, building and gaining support from a network of NGOs, academics and Indigenous rights-advocacy groups such as

[6] Controversially, the right to aval under *hakulayat* cannot be used against state interest under Article 3, or be registered.

[7] In Maluku, conflict erupted during the post-Suharto period from 1999 into 2004/2005, often referred to as the Maluku wars.

Baileo Foundation and the *Aliansi Masyarakat Adat Nusantara* (Alliance of Indigenous Peoples of the Archipelago – AMAN) and the National Commission on Indigenous Peoples Rights (Batiran & Salim, 2020). Head *Kewang* commented, "I brought legal experts from Unpatti [the local university], and they provided legal counseling for the community … because if the mine had a future, it would have been bleak for us, and we would have had to leave this village."

Meanwhile, in Kulon Progo, the same strategies that have spurred resilience in cultivating productive agricultural systems and livelihoods in marginalised, or in unproductive conditions in a harsh coastal landscapes, have also ensured continued active engagement in adapting strategies for retaining land access. Conflict over land use has been heated over the last decade due to sand mining proposals for coastal agricultural lands. Farmer access to farming lands remains insecure for the area, as under the special region status, land management and ownership remain subject to the Sultan of Yogyakarta, rather than the national Government of Indonesia for areas equivocal to government or "crown" lands. *Pakualaman* Ground (PAG) or *Tanah Pakualaman* is a term for land held under the *Duchy of Pakualaman*, or the Sultanate of Yogyakarta. With the status of *Pakualam Tanah Sultan,* legal ownership is difficult for residents, who instead are granted only *Magersari*, or right of use. While residents own their houses on the land, maintaining access to land with this status is insecure. All nonprivate land areas formally held under crown land had been transferred to the Republic of Indonesia under the 1960 Basic Agrarian Law (BAL). These lands were allocated to be used for local communities and public land. However, in 2012, laws for the Yogyakarta District were changed, which altered the status of the Agrarian Law No.5/1960. In practice, this meant that vast tracts of lands used and occupied for generations by local communities prior to and since Indonesia's Independence, were suddenly subject to seizure under Law No. 13 of 2012 concerning the Privileges of DIY (UUK). Numerous conflicts have been recorded throughout the Yogyakarta Province concerning evictions from land following this law change.[8] The most contentious have included industry parks, mining operations, the international airport and other private-investment commercial operations (hotels, apartments). Coastal farmlands in Kulon

[8] For example, (1) construction of the International Airport in Kulonprogo; (2) mining of iron sands and construction of a steel factory in Kulonprogo; (3) eviction of residents' settlements in Parangkusumo; (4) eviction of shrimp ponds in Parangkusumo; (5) pegging of sultan ground (SG) on state land in Parangkusumo; (6) fixing SG's land on community-owned land in Mancingan Parangtritis; (7) confiscation of land rights through changing the status of building use rights on Jalan Solo Kotabaru; (8) eviction of a group of residents in Suryowijayan; (9) threats of eviction of street vendors under the pretext of SG's land in Gondomanan; (10) revitalization of the Kepatihan Office which resulted in eviction in Suryawijayan; (11) seizure of village land through reversing the name of village land certificates throughout DIY; (12) racial/ethnic discrimination through the prohibition of land ownership rights throughout DIY; (13) refusal to extend building use rights in Jogoyudan, Jetis; (14) refusal to apply for land title certificates in Blunyahgede; (15) construction of apartments in densely residential areas on Jalan Kaliurang km 5; (16) withdrawal of property rights certificates under the pretext of renewing certificates in Mantrijeron; (17) seizure of land rights through cancellation of land ownership rights in Pundungsari; (18) seizure of state and citizen land in the name of controlling SG land and tourism throughout Gunungkidul; (19) forced eviction and demolition of community stalls under the pretext of SG land (Saroh, 2016).

Progo are earmarked for large-scale commercial projects (e.g., iron sand mining). At the same time, the Kulon Progo district government is in an impasse as they cannot build infrastructure to support the activities of the residents on these sites because the area is under status as a contract area (Hernawan et al., 2021). Until now, farmers in the area have resisted eviction, partially due to legal rights remaining unclear, as well as ongoing viability issues and investor pull-outs on the proposed developments. Efforts have also been sustained within social networks and collective action, such as farmer forums and networks for knowledge sharing and support (farmer to farmer).

At the same time, precarious access has merged with ongoing pressures and conflict to spur enduring strategies to adapt to harsh environmental conditions through the ongoing need to secure access to land and resources. Aside from active resistance and strategies deployed to retain access to farmlands, the coastal villages in Kulon Progo are widely known for the strategies employed in farming land unfavourable for agricultural due to harsh coastal conditions. The villages engaged in farming on the coastal area of Kulon Progo have a history of local innovations in responding to change and non-favourable agricultural conditions, including strategies for adaptation to climate change conditions and impacts. The coastal farming areas of Kulon Progo (Desa Garongan, Kulon Progo, Barangan, Pleret and Bugel) have sustainably farmed in harsh coastal conditions of sandy soils, salinity, high winds, and limited water access, after converting the area to a high yielding agricultural area. The cultivation of the upper sand dunes by farmers along this small section of coastline consistently boasts Indonesia's largest chili crop, while other crops are also cultivated. Chilli has been adapted to grow through the wet season, when other areas of Indonesia are unable to produce, in turn, gaining higher price values as a result of the produce. Studies on the area have shown highly innovative adaptive farming techniques employed (Dinarti et al., 2013; Supriyanto et al., 2012). In particular, innovative agricultural livelihood diversification is based around collective management systems (Raya, 2014). These systems were found to emphasize reciprocal social relations used to foster local resource governance conducive to the ongoing adaptation of land management, which is also applicable to climate change (Supriyanto et al., 2011, 2012). The latter study particularly highlights coastal farmers' in Kulon Progo's ability to control environmental, physical, economic, human, and political forms of capital to build up an active, innovative, and adaptive farming community in the coastal area. Notably, these systems have enabled an agricultural livelihood-based community to flourish in a sandy coastal environment utilized as highly productive agricultural land.

Since the early 1980s, the farmers expanded the land available to them by cultivating the coastline area, utilizing a mix of local indigenous knowledge informing land management practices and ingenuity driven by scarce available resources – in order to farm in sand on the wind-swept coastal area. Innovative strategies have been formulated in response to the harsh environmental conditions in which to generate livelihoods, collective action has formed as a way of sustaining livelihoods. These innovations have incorporated the use of watering technology, merging techniques to intensify cropping options (wells, pumps, drip enhanced efficiency, piping); adaptation of techniques such as companion planting, permaculture,

composting, on-site organic manure fertilisers); diversification and increased biodiversity of cropping (e.g. buffering from reliance and market dependence, windbreak cropping).

Social networks and collective action also form a large aspect to enabling this, from streamlining trial and error learning (neighbors replicating successes), farmer forums and networks were also developed for knowledge sharing and support (farmer to farmer). These have helped with strategic actions such as adapting seed varieties and cultivars, and the establishment of cooperatives to determine marketing and pricing collectively, as well as pooling transport logistics, and community systems for managing shared resources between farmers (e.g., windbreak vegetation and water resources). These actions extend to responses to market conditions (formulating cooperatives to ensure reliable market price for produce), as well as for ensuring climate change impact driven issues, such as growing incidence of pests, are controlled through group mechanism calendar that collectively governs periods for harvesting in order to eliminate fungus and pests from ruining all crops. Amongst other examples, farmers agree, regardless of whether they still have remaining produce to harvest, to pull out chili plants on the agreed dates so that the soil can be left 'to rest', and pests are unable to take a hold.

22.5 Innovating Adaptive Capacity to Climate Change: Collective Local Governance

In both case studies, overcoming environmental pressures, conflict and change through local governance approaches have been important to driving adaptive capacity, both generally, and to climate change for several reasons. The drive in securing access and sustainable use of resources through collective responses has been critical in also driving the factors that support climate change resilience and the adaptive capacity of residents in both cases. For *Masyarakat Adat* in Haruku, adaptive capacity and ways to respond to climate change have primarily centred on customary cultural and resource land management practices to guard local ecosystem integrity. These practices guard the sustainability of local ecosystem integrity and offer a diversity of options for livelihood security. Customary rules mean that resources are therefore used most efficiently, usefully and are maintained within ecological bounds sustainably (e.g. young fruit in the forest should not be taken so that they have the opportunity to first grow and produce seed). The customary practices guard *Negeri* ecosystem integrity, by ensuring the resilience of the environmental systems are more robust in facing climate change conditions, including the diversity of food systems.

Sasi is the traditional community-based resource governance system of Haruku. Present throughout Maluku, Sasi is found from the northern Islands of Halmahera, Ternate, Buru, Seram, Ambon and Haruku, to the south and southeast of Banda, Kei and Aru, as well as throughout areas of Papua. Although Haruku is one of the

remaining villages in the Maluku islands that maintains and practices the tradition of *Sasi*. *Sasi* provides guidance and sanctions enforced by *Kewang*[9] as the rules of the *Negeri*. *Sasi* stipulates the management of agroforestry and marine and fishery resources and is widely considered one of the few remaining long-enduring community-based resource management systems in Asia (Novaczek et al., 2001). *Sasi* is also the longest enduring traditional community-based coastal resource management system in Southeast Asia. It is dated to have been the system of use in the area since the sixteenth century – in providing guidance both for conservation practices and social issues and essentially maintaining natural food resources (Zerner, 1994). *Sasi* is endowed as providing the system of customary law governing social and environmental resources, both terrestrial and marine, throughout the Island of Haruku (Zerner, 1994). *Sasi* as customary law is set out in three areas – firstly, as regarding the governance of resources relating to conservation and protection of the environment and environmental resources. Secondly, in social customs, habits and values, and thirdly, in defining the implementation of the laws and their enforcement. Ultimately employing methods of timing and space in order to regulate access to resources and territories (Novaczek et al., 2001). In turn, these effectively maintain a sustainable ecological, livelihood, and conservation equilibrium (e.g., customary forest conservation, fish stock sustainability practices).

Land in Haruku is allocated as customary land, and while the land is inherited within families, most of the land within the *Negeri* is allocated as customary land and therefore shared. *Kewang* serve as representatives of the customary law and traditions of *Sasi*, found throughout Central Maluku, responsible for controlling environmental management of all resources in the village domain, especially during the *Sasi* (control or protection time periods) (Soselisa, 2019). The *Kewang* designated through family linage are selected members from family clans to guard and enforce the terms of customary Law or *Sasi* – controlling governance and protecting natural resources, both land and marine. In particular, *Kewang* hold responsibility for periods in which resources are protected or guarded to ensure their sustainability. The *Kewang* are also elected to discuss village economy, the coordination of village economic and livelihood aspects, including infringements of *Sasi* regulations, and boundary controls with neighbouring villages, including the patrols of (common) natural resources, both marine and terrestrial (Mantjoro, 1996; Zerner, 2014). *Kewang* also monitor and manage conflict, such as when someone is caught violating the *Sasi* in the *petuanan* area, the *Kewang* will hold a hearing and decide sanctions.

Sasi comprehensively guides everything (Zerner, 1994), to ensure that all-natural food systems are well-managed and sustained. For example, *Sasi* ensures that the forest is maintained sustainably, prohibiting the young fruits from being taken so that they can reproduce first. *Sasi* also ensures that the lompa fish are not taken until they have completed their breeding cycle and are of a certain size. *Sasi*, when closed,

[9] *Kewang* are the custodians of *Sasi* (customary law) in Haruku (and throughout some other islands of Maluku).

means that no harvest of that resource can take place whatsoever during the time. It is signalled by certain symbolic signs placed in front or on the resource (e.g. tree, fruit, bush, fish type) being protected (Zerner, 1994). *Sasi* rules also form part of the vow of the ancestors (*ina ama*), which are maintained continuously to become the norms, values and practices among community life (Batiran & Salim, 2020). Although according to *Kewang, Sasi* is constantly being adapted and updated to remain relevant and appropriate and that the laws are not fixed.

Diversity and timing have been significant for maintaining livelihoods and has been built over generations in Haruku. Before climate change, variations affecting seasons and the predictability of rain and dry periods, along with impacts from increased heat and storms and inundation timing, were balanced carefully. For these reasons, the collective responses to environmental pressures, conflict and change are therefore vital also in driving adaptive capacity to climate change, with maintaining access to resources and the sustainable use of those resources being vital to local communities' resilience to climate change. "We have [traditional] staples based on sago – bapeda, as well as kasbi [casava] and others. Kasbi isn't affected by pests, variable rains, storms or waves, or earthquakes. No one goes hungry also because we also all share. We have double livelihoods that we can swap between if the conditions are not right to go to the sea because of either climate change or earthquakes and the threat of a tsunami."

In Haruku, for example, although *Sasi* protects and maintains fish stocks, the areas within the Haruku *Negeri* boundaries are regularly robbed, putting fish numbers in jeopardy. Despite clear boundary demarcations, disputes exist over access and use, mainly over commonly held resources, such as marine resources. Fishing trawlers and illegal fishing are ongoing within the area. Whereas *Negeri* Haruku and Haruku village are bound by *Sasi* regulations on fish catch numbers and methods, neighboring villages use fish bombing or dynamite fishing methods. "Fish are difficult to come by in the neighboring village because their habit is to use fish bombing [dynamite fishing]. Whereas here, you can just be sitting on the seawall and catch fish." To overcome issues such as illegal fishing and use of destructive techniques like dynamite fishing throughout the *Sasi* protected fish grounds, the *Kewang* run intercountry cooperation, drawing on and pooling networks to collectively overcome environmental resource pressures and conflicts. "We work together to protect the coast so that people can no longer come with fish bombs to destroy the coral reefs."

Kulon Progo farmers, according to the generation, rely on the local customary indigenous system of *Pranata Mangsa. Pranata mangsa* is calendar system used in farming practices in Java that follow nature as a guide for farming and fishing, with a relationship focused on environmental cycles (Retnowati et al., 2014). The land cultivation utilizes knowledge informing land management practices (e.g., lunar-solar calendar in dictating farming practices, known as *pranata mangsa*), as well as the innovation from ingenuity in scarce resource access that have gradually allowed for sophisticated farming to develop in sand soil on a wind, swept coastline. The *pranata mangsa* calendar uses nature as a guide for farming and fishing, within a relationship focused on environmental cycles (Retnowati et al., 2014). *Pranata Mangsa* follows the circulation of the sun over the year using aspects of phenology

and signaling to guide farming activities, as well as preparation for disasters (such as drought, disease outbreaks, floods, pests) that may occur at certain times. The calendar system ascribes timings to the seasons – such as dry season, the transition season before the rainy season, the rainy season and the transition at the end of the rainy season, all with a certain number of days each between them. *Pranata Mangsa* is a system used widely throughout Java as a local calendar and planning method for agriculture and fishing but dramatically shifting under climate change. Part of which includes reading signs from nature, known as *titen*, and built into farmers' process of observing agro-meteorological changes by observing, recording, analyzing, and evaluating existing knowledge for adaptation. With each of these signals there are particular times for planting and harvesting of certain crops (Retnowati et al., 2014).

Interlinked with these systems and ongoing innovations, farmers say they are now continuously shifting around the climate although they have always planned their activities around the shifting of the seasons. "We were already adjusting to the climate from that of our ancestors. So, the pattern of the planting is already a season of certain months it is a type of plants. It means that the agriculture sector has also adjusted to climate change. If it was before there was already the pattern." However, the timescales for shifting have altered, and they are now left to shift dramatically as rainfall and season patterns vary. "Farmers here are already sensitive to anticipate climate change." For the increased heat periods, for example, farmers start earlier to water their crops so that the water can permeate, and then water again in the evenings. "It used to be in one day that we are watering it two-three hours may be enough. But if it is now at least every four hours to five hours or even six hours." Farmers say they change the system so that they can retain moisture for more protracted timeframes, by using mulch, as well as continually planting windbreaks and trees to break up the sun, dry wind, and heat. Locals claim that the extreme weather variation has resulted in more crop disease, particularly fungus and that they have also lost produce regularly. So, the area collectively coordinates plantings and uses agreements on dates as to when certain crops will be harvested and pulled out in order to minimize the risk of disease for all. A period of "sanitation" is undergone, mutually, between all farmers collectively so that the chain of disease is broken. "To neutralize the PH of the soil, we use dolomite and rotate the crops. Using intercropping, for example, we will create a wedge there with long beans, then there with peanuts and vegetables. To break up the chance of pest incidence."

22.6 Conclusion

Climate change is significantly impacting local communities throughout Indonesia dependent on access to ecosystems and weather-dependent resources. Nevertheless, local communities have been responding and adapting to ongoing and rapid environmental change and pressures for decades, utilizing collective approaches to local resource governance that are adaptive. Local resource governance innovates and engages strategies of adaptation to drive the ability to deal with environmental

pressures, conflict, and change. These methods of responding and adapting to change are also crucial in how climate change responses are formed.

This chapter has briefly shown through case studies how local communities govern, innovate, and engage strategies of adaptation to change to land-use pressures and environmental change. The case studies in this chapter provide examples of how local-level community customary institutions in Indonesia foster norms of reciprocity for cooperation and coordinated actions. These collective mechanisms are crucial in the reciprocal and social relations needed for dealing with an array of hardships arising from pressure, conflict, and change and including climate change impacts. These examples provide insights into the collective handling of environmental risks and local governance of natural resources that correlate with the ways local communities can govern, innovate, and engage adaptation strategies to deal with environmental stresses and change including climate. By being active in their resilience and adaptation strategies to other (nonclimate) types of social and environmental pressures and change, these cases have shown the local agency, self-determination, and collective action that is prominent in driving adaptive capacity to environmental pressures and change within the local resource governance.

References

Adger. (2003a). Social aspects of adaptive capacity. In J. B. Smith, R. J. T. Klein, & S. Huq (Eds.), *Climate change, adaptive capacity and development* (pp. 29–49). Imperial College Press and distributed by World Scientific Publishing Co.. https://doi.org/10.1142/9781860945816_0003

Adger. (2003b). Social capital, collective action, and adaptation to climate change. *Economic Geography; Oxford, 79*(4), 387–404.

Adger, W. N., Agrawala, S., Mirza, M. M. Q., Conde, C., O'Brien, K., Pulhin, J., Pulwarty, R., Smit, B., Takahashi, K., Enright, B., Fankhauser, S., Ford, J., Gigli, S., Jetté-Nantel, S., Klein, R. J. T., Pearce, T. D., Shreshtha, A., Shukla, P. R., Smith, J. B., … Hanson, C. E. (2007). Assessment of adaptation practices, options, constraints and capacity. In *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (p. 28). Cambridge University Press.

Anwar, H. Z., Yustiningrum, E., Andriana, N., Kusumawardhani, D. T. P., Sagala, S., & Mayang Sari, A. (2017). Measuring community resilience to natural hazards: Case study of Yogyakarta province. In R. Djalante, M. Garschagen, F. Thomalla, & R. Shaw (Eds.), *Disaster risk reduction in Indonesia: Progress, challenges, and issues* (pp. 609–633). Springer. https://doi.org/10.1007/978-3-319-54466-3_25

Ayers, J. (2010). *Understanding the adaptation paradox: Can global climate change adaptation policy be locally inclusive?* London School of Economics and Political Science. http://etheses.lse.ac.uk/393/1/Ayers_Understanding%20the%20Adaptation%20Paradox.pdf

Bartlett, L., & Vavrus, F. (2016). *Rethinking case study research: A comparative approach*. Routledge. https://doi.org/10.4324/9781315674889. eBook ISBN9781315674889.

Batiran, K., & Salim, I. (2020). A Tale of Two Kewangs: A comparative study of traditional institutions and their effect on conservation in Maluku. *Forestry and Society, 4*(1), 81. https://doi.org/10.24259/fs.v4i1.8186

Bebbington, A., Dharmawan, L., Fahmi, E., & Guggenheim, S. (2006). Local capacity, village governance, and the political economy of rural development in Indonesia. *World Development, 34*(11), 1958–1976. https://doi.org/10.1016/j.worlddev.2005.11.025

Bedner, A. (2016). Indonesian land law: Integration at last? And for whom? In J. F. McCarthy & K. Robinson (Eds.), *Land and development in Indonesia: Searching for the people's sovereignty* (pp. 63–88). ISEAS–Yusof Ishak Institute. https://www.cambridge.org/core/books/land-and-development-in-indonesia/indonesian-land-law-integration-at-last-and-for-whom/814ED122711109DF92EFF35F6996CEAA

Berkes, F., Colding, J., & Folke, C. (2008). *navigating social-ecological systems: Building resilience for complexity and change*. Cambridge University Press.

Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge University Press.

Bowen, J. R. (1986). On the political construction of tradition: Gotong Royong in Indonesia. *The Journal of Asian Studies, 45*(3), 545–561. https://doi.org/10.2307/2056530

BPS. (2016). *Indonesia – National Socio-economic survey 2016 March* (National Socio-Economic Survey (SUSENAS)). Data from Central Bureau of Statistics (BPS). https://microdata.bps.go.id/mikrodata/index.php/catalog/768

BPS. (2020). *Badan Statistik Indeks Pembangunan Manusia (Central Bureau of Statistics – Social and population – Employment)*. Badan Pusat Statistik (BPS)/ Central Burea of Statistics, Indonesia.

Dahal, G. R., & Adhikari, K. P. (2008). *Bridging, linking, and bonding social capital in collective action: The case of Kalahan Forest Reserve in the Philippines* (No. 577-2016–39220). AgEcon Search. https://doi.org/10.22004/ag.econ.44352

Dasgupta, P., Morton, J., Dodman, D., Karapinar, B., Meza, F., Rivera-Ferre, M. G., Toure Sarr, A., & Vincent, K. E. (2014). Rural areas. In C. Field & V. Barros (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability: Vol. A* (pp. 613–657). Cambridge University Press. https://gala.gre.ac.uk/id/eprint/14369/

Davidson, J., & Henley, D. (2007). *The revival of tradition in Indonesian Politics: The deployment of Adat from colonialism to indigenism*. Routledge.

Dinarti, S. I., Wastutiningsih, S. P., Subejo, S., & Supriyanto, S. (2013). Kecerdasan Kolektif Petani Di Lahan Pertanian Pasir Pantai Kecamatan Panjatan Kabupaten Kulon Progo (Collective innovation of farmers in Pasir Pantai Farming District, Panjatan District, Kulon Progo Regency). *Agro Ekonomi, 24*(1), 86–98. https://doi.org/10.22146/jae.18328

Djalante. (2018). NHESS – Review article: A systematic literature review of research trends and authorships on natural hazards, disasters, risk reduction and climate change in Indonesia. *Natural Hazards and Earth System Sciences, 18*, 1785–1810. https://doi.org/10.5194/nhess-18-1785-2018

Dodman, D., Karapinar, B., Meza, F., Rivera-Ferre, M., Sarr, A., & Vincent, K. (2014). Rural areas. In C. Field, V. Barros, D. Dokken, M. March, T. Mastrandrea, T. Bilir, M. Chatterjee, K. Ebi, Y. Estrada, R. Genova, B. Girma, E. Kissel, A. Levy, S. MacCracken, P. Mastrandrea, & L. White (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 613–657). Cambridge University Press.

EMDAT. (2020). *Emergency events database (EM-DAT)* (The International Disaster Database) [Custom request]. Centre for Research on the Epidemiology of Disasters (CRED), Université catholique de Louvain (UCLouvain). www.emdat.be

Ford, J. D., McDowell, G., Shirley, J., Pitre, M., Siewierski, R., Gough, W., Duerden, F., Pearce, T., Adams, P., & Statham, S. (2013). The dynamic multiscale nature of climate change vulnerability: An inuit harvesting example. *Annals of the Association of American Geographers, 103*(5), 1193–1211. https://doi.org/10.1080/00045608.2013.776880

Gallopín, G. C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change, 16*(3), 293–303. https://doi.org/10.1016/j.gloenvcha.2006.02.004

Gaspersz, E. J., & Saiya, H. G. (2019). Pemetaan Kearifan Lokal Budaya Sasi Di Negeri Haruku Dan Negeri Kailolo, Pulau Haruku, Kabupaten Maluku Tengah (Mapping Of The Local Awareness Of The Sasi Culture In Haruku State And The Country Of Kailolo, Haruku Island, Central Maluku District). *Seminar Nasional Geomatika, 3*, 107. https://doi.org/10.24895/SNG.2018.3-0.933

Gibson, L., Widiastuti, D., Maulana, A., Nikmah, S., Bahagijo, S., Patria, N., Bernabe, M., Hardoon, D., Galasso, N., Jacobs, D., Marriot, A., Marriotti, C., & Kamal-Yanni, M. (2017). *Towards a more equal Indonesia: How the government can take action to close the gap between the richest and the rest* (p. 48) [Briefing paper]. Oxfam GB for Oxfam International. https://oi-files-d8-prod.s3.eu-west-2.amazonaws.com/s3fs-public/bp-towards-more-equal-indonesia-230217-en_0.pdf

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. University of California Press. ISBN 978-0-520-05292-5.

Glaser, B. G., & Strauss, A. L. (1987). *Discovery of grounded theory: Strategies for qualitative research* (1st ed.). Routledge.

Grecksch, K., & Klöck, C. (2020). Access and allocation in climate change adaptation. *International Environmental Agreements: Politics, Law and Economics, 20*(2), 271–286. https://doi.org/10.1007/s10784-020-09477-5

Ha, W. (2010). Social capital and crisis coping in Indonesia. In R. Fuentes-Nieva & P. A. Seck (Eds.), R*isk, shocks, and human development: On the brink* (pp. 284–309). Palgrave Macmillan UK. https://doi.org/10.1057/9780230274129_12

Hall, D., Hirsch, P., Li, T., & Challenges of the Agrarian Transition in Southeast Asia (Project). (2011). *Powers of exclusion: Land dilemmas in Southeast Asia*. University of Hawai'i Press.

Hallatu, T. G. R., Palittin, I. D., Supriyadi, Yampap, U., Purwanty, R., & Ilyas, A. (2020). The role of religious sasi in environmental conservation. *IOP Conf. Series: Earth and Environ. Sci, 473*, 012082. IOP Publishing. https://doi.org/10.1088/1755-1315/473/1/012082

Handoko, W., Larasati, E., Pradhanawati, A., & Santosa, E. (2019). Why land conflict in rural Central Java never ended: Identification of resolution efforts and failure factors. *Eurasian Journal of Social Sciences, 7*(1), 11–23.

Hernawan, A., Arumingtyas, L., Ricky P. D. M., Hasibuan, S., & Purnomo Edi, C. (2021). *Deru Patok Tanah 'Istimewa', Petani akan Terus Bertahan dan Menanam (The fight of 'special' land stakes, farmers will continue to survive and farm)* [By the Agrarian Coverage Collaboration Team on 19 September 2021]. Mongabay.Co.Id. https://www.mongabay.co.id/2021/09/19/deru-patok-tanah-istimewa-petani-akan-terus-bertahan-dan-menanam-4/

Hill, M., & Engle, N. L. (2013). Adaptive capacity: Tensions across scales. *Environmental Policy and Governance, 23*(3), 177–192. https://doi.org/10.1002/eet.1610

Hinkel, J. (2011). "Indicators of vulnerability and adaptive capacity": Towards a clarification of the science–policy interface. *Global Environmental Change, 21*(1), 198–208. https://doi.org/10.1016/j.gloenvcha.2010.08.002

Idajati, H., Pamungkas, A., Kukinul, S. V., Fadlillah, U., Firmansyah, F., Nursakti, A. P., & Pradinie, K. (2016). Increasing community knowledge of planning process and online Musrenbang process in Rungkut District Surabaya. *Procedia - Social and Behavioral Sciences, 227*, 493–497. https://doi.org/10.1016/j.sbspro.2016.06.105

IPCC. (2022). *Climate change 2022: Impacts, adaptation and vulnerability* (Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change). Intergovernmental Panel on Climate Change (IPCC).

Ireland, P., & McKinnon, K. (2013). Strategic localism for an uncertain world: A postdevelopment approach to climate change adaptation | Kopernio. *Geoforum, 47*, 158–166. https://doi.org/10.1016/j.geoforum.2013.01.005

Karlsson, B. G. (2003). Anthropology and the 'Indigenous Slot': Claims to and Debates about Indigenous Peoples' Status in India. *Critique of Anthropology, 23*(4), 403–423. https://doi.org/10.1177/0308275X03234003

Kusumawardhani. (2014). Nilai Gotong Royong sebagai Modal Sosial dalam Pengurangan Risiko Bencana Alam: Kasus Sleman dan Bantul, Masyarakat Tangguh Bencana: Pendekatan Sosial Ekonomi (The value of mutual cooperation as social capital in reducing risk natural disasters: Cases of Sleman and Bantul, disaster resilient communities: Socio-economic approach). In H. Z. Anwar (Ed.), *Tata Kelola dan Tata Ruang (Spatial planning governance)* (1st ed.). Pusat Penelitian Geotecknologi LIPI (LIPI Geotechnological Research Center).

Li, T. M. (1996). Images of community: Discourse and strategy in property relations. *Development and Change, 27*(3), 501–527. https://doi.org/10.1111/j.1467-7660.1996.tb00601.x
Li, T. M. (1999). Compromising power: Development, culture, and rule in Indonesia. *Cultural Anthropology; Washington*, *14*(3), 295–322. http://dx.doi.org.virtual.anu.edu.au/10.1525/can.1999.14.3.295
Lukiyanto, K., & Wijayaningtyas, M. (2020). Gotong Royong as social capital to overcome micro and small enterprises' capital difficulties. *Heliyon, 6*(9), e04879. https://doi.org/10.1016/j.heliyon.2020.e04879
Lund, & Rachman, N. (2016). Occupied! Property, citizenship and peasant movements in rural Java. *Development and Change, 47*(6). https://doi.org/10.1002/9781119384816.ch6
Lund, J. F., & Saito-Jensen, M. (2013). Revisiting the issue of elite capture of participatory initiatives. *World Development, 46*, 104–112. https://doi.org/10.1016/j.worlddev.2013.01.028
Mantjoro, E. (1996). Traditional management of communal-property resources: The practice of the Sasi system. *Ocean and Coastal Management, 32*(1), 17–37. https://doi.org/10.1016/S0964-5691(96)00013-0
Mardiasmo, A., & Barnes, P. (2015). Community response to disasters in Indonesia: Gotong Royong; a double edged-sword. In P. Barnes & A. Goonetilleke (Eds.), *Proceedings of the 9th annual international conference of the international institute for infrastructure renewal and reconstruction* (pp. 301–308). Queensland University of Technology. http://digitalcollections.qut.edu.au/2213/
Martin, P. Y., & Turner, B. A. (1986). Grounded theory and organizational research. *The Journal of Applied Behavioral Science.* https://doi.org/10.1177/002188638602200207
McCarthy, J. F. (2017). *Land and development in Indonesia*. Flipside Digital Content Company Inc.
McCarthy, J. F., & Robinson, K. (2016). Land, economic development, social justice and environmental management in Indonesia: The search for the people's sovereignty. In J. F. McCarthy & K. Robinson (Eds.), *Land and development in Indonesia: Searching for the people's sovereignty* (pp. 1–32). ISEAS–Yusof Ishak Institute. https://www.cambridge.org/core/books/land-and-development-in-indonesia/land-economic-development-social-justice-and-environmental-management-in-indonesia-the-search-for-the-peoples-sovereignty/964B20CE91549FD9C5D0BF4625331D04
Mony, A., Satria, A., & Kinseng, R. A. (2017). Political ecology of Sasi Laut: Power relation on society-based coastal management. *Journal of Rural Indonesia [JORI], 3*(1) Retrieved from http://ejournal.skpm.ipb.ac.id/index.php/ruralindonesia/article/view/30
Muur, W. V. D. (2018). Forest conflicts and the informal nature of realizing indigenous land rights in Indonesia. *Citizenship Studies, 22*(2), 160–174. https://doi.org/10.1080/13621025.2018.1445495
Muur, W. V. D., Vel, J., Fisher, M. R., & Robinson, K. (2019). Changing indigeneity politics in Indonesia: From revival to projects. *The Asia Pacific Journal of Anthropology, 20*(5), 379–396. https://doi.org/10.1080/14442213.2019.1669520
Myers, M. D. (2009). *Qualitative research in business and management*. SAGE. https://uk.sagepub.com/en-gb/asi/qualitative-research-in-business-and-management/book244733
Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: Contributions of a resilience framework. *Annual Review of Environment and Resources, 32*(1), 395–419. https://doi.org/10.1146/annurev.energy.32.051807.090348
Novaczek, I., Harkes, I. H. T., Sopacua, J., & Tatuhey, M. D. D. (2001). *Institutional analysis of Sasi Laut in Maluku, Indonesia*. ICLARM. https://idl-bnc-idrc.dspacedirect.org/handle/10625/30324
Pelling, M. (1999). The political ecology of flood hazard in urban Guyana. *Geoforum, 30*(3), 249–261. https://doi.org/10.1016/S0016-7185(99)00015-9
Peluso, N. L., Afiff, S., & Rachman, N. F. (2008). Claiming the grounds for reform: Agrarian and environmental movements in Indonesia. *Journal of Agrarian Change, 8*(2–3), 377–407. https://doi.org/10.1111/j.1471-0366.2008.00174.x

Platteau. (2004). Monitoring elite capture in community-driven development. *Development and Change, 35*(2), 223–246. https://doi.org/10.1111/j.1467-7660.2004.00350.x

Platteau, & Abraham, A. (2002). Participatory development in the presence of endogenous community imperfections. *The Journal of Development Studies, 39*(2), 104–136. https://doi.org/10.1080/00220380412331322771

Purba, R. E. (2011). Public participation in development planning: A case study of Indonesian Musrenbang. *The International Journal of Interdisciplinary Social Sciences: Annual Review, 5*(12), 265–278. https://doi.org/10.18848/1833-1882/CGP/v05i12/51964

Raya, A. B. (2014). Farmer group performance of collective chili marketing on sandy land area of Yogyakarta Province Indonesia. *Asian Social Science, 10*(10), 1. https://doi.org/10.5539/ass.v10n10p1

Retnowati, A., Anantasari, E., Marfai, M., & Dittman, A. (2014). Environmental ethics in local knowledge responding to climate change: An understanding of seasonal traditional calendar PranotoMongso and its Phenology in Karst Area of GunungKidul, Yogyakarta, Indonesia. *Procedia Environmental Sciences, 20*, 785–794. https://doi.org/10.1016/j.proenv.2014.03.095

Ribot. (2007). Representation, citizenship and the public domain in democratic decentralization. *Development, 50*(1), 43–49. https://doi.org/10.1057/palgrave.development.1100335

Ribot, J. C., Magalhães, A. R., & Panagides, S. (Eds.). (1996). *Climate variability, climate change and social vulnerability in the semi-arid tropics*. Cambridge University Press. https://doi.org/10.1017/CBO9780511608308

Saroh, M. (2016). Warga Terdampak Penggusuran Gugat UU Keistimewaan Yogyakarta (Residents Affected by Evictions Sue - Yogyakarta Privileges Law). *tirto.id*. https://tirto.id/warga-terdampak-penggusuran-gugat-uu-keistimewaan-yogyakarta-bLm8

Simarmata, H. A., Sianturi, H. C. J. A., & Yudono, K. (2013, June 31). *Measuring Vulnerability: Lesson from vulnerable groups along the example of Kampongs in North Jakarta*. Proceedings of the Resilient Cities 2013 Congress: Urban Resilience and Adaptation. Resilient Cities 2013 congress, Bonn, Germany.

Sindre, G. M. (2012). Civic engagement and democracy in post-Suharto Indonesia: A review of Musrenbang, the Kecamatan development programme, and labour organising. *PCD Journal*, 1–40.

Slikkerveer, L. J. (2019). Gotong Royong: An indigenous institution of communality and mutual assistance in Indonesia. In L. J. Slikkerveer, G. Baourakis, & K. Saefullah (Eds.), *Integrated community-managed development: Strategizing indigenous knowledge and institutions for poverty reduction and sustainable community development in Indonesia* (pp. 307–320). Springer. https://doi.org/10.1007/978-3-030-05423-6_14

Soselisa, H. L. (2019). Sasi Lompa: A critical review of the contribution of local practices to sustainable marine resource management in Central Maluku, Indonesia. *IOP Conference Series: Earth and Environmental Science, 339*, 012013. https://doi.org/10.1088/1755-1315/339/1/012013

Supriyanto, Herianto, A. S., & Wastutiningsih, S. P. (2011, December 8). *Modal sosial komunitas petanti lahan pasir pantai Kecematan Panjatan Kabupaten Kulon Progo* (Social community model in the coastal sand area of Panjatan Subdistrict, Kulon Progo Regency). Proceeding of the National Seminar on the Research Results of the Socioeconomics Department in Yogyakarta. Prosiding Seminar Nasional Hasil Penelitian Jurusan Sosial Ekonomi Pertanian di Yogyakarta.

Supriyanto, Subejo, S., Herianto, I. A. S., Wastutiningsih, S. P., Dinarti, S. I., & Winanti, L. D. (2012). *Strategi Adaptasi Petani Terhadap Perubahan Iklim*. PINTAL.

Suwignyo, A. (2019). Gotong royong as social citizenship in Indonesia, 1940s to 1990s. *Journal of Southeast Asian Studies, 50*(3), 387–408. https://doi.org/10.1017/S0022463419000407

Tyson, A. D. (2010). *Decentralization and adat revivalism in Indonesia: The politics of becoming indigenous*. Routledge. https://doi.org/10.4324/9780203849903

van Engelenhoven, G. (2021). From indigenous customary law to diasporic cultural heritage: reappropriations of adat throughout the history of Moluccan postcolonial migration. *International Journal for the Semiotics of Law – Revue Internationale de Sémiotique Juridique, 34*(3), 695–721. https://doi.org/10.1007/s11196-020-09781-y

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems. *Ecology and Society*, *9*(2). http://www.jstor.org/stable/26267673

Warren, C., & McCarthy, J. F. (2009). *Community, environment and local governance in Indonesia: Locating the commonweal*. Taylor & Francis Group. http://ebookcentral.proquest.com/lib/anu/detail.action?docID=1024674

Wilhelm, M. (2011). The role of community resilience in adaptation to climate change: The urban poor in Jakarta, Indonesia. In K. Otto-Zimmermann (Ed.), *Resilient cities* (pp. 45–53). Springer. https://doi.org/10.1007/978-94-007-0785-6_5

World Bank. (2020, April). *Indonesia overview*. The World Bank in Indonesia. https://www.worldbank.org/en/country/indonesia/overview

Yuliastuti, N., Alie, J., & Soetomo, S. (2015). The role of community institutions "Rukun Tetangga" in social housing, Indonesia. *International Journal of Humanities and Social Science, 5*, 44–52.

Zerner, C. (1994). Through a green lens: The construction of customary environmental law and community in Indonesia's Maluku Islands. *Law and Society Review, 28*(5), 1079–1122. https://doi.org/10.2307/3054024

Zerner, C. (2014). Through a green lens: The construction of customary environmental law and community in Indonesia's Maluku Islands. *Law and Society Review, 28*(5), 1079–1122. https://doi.org/10.18574/9780814789339-044

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Part VI
Social and Technological Interventions

Chapter 23
Local Governance of Sustainability Transition in Community-Scale Solar Water Pumping Systems in Indonesia

Sita Rahmani, Takehiko Murayama, Shigeo Nishikizawa, and Muhammad Sani Roychansyah

Abstract Sustainability transition emerges in various types of community-scale projects. Indonesia has been actively implementing solar water pumping systems (SWPS) since 1982. However, for almost four decades, SWPS, as a niche innovation, have not achieved significant adoption of solar technology in the water utility sector. This study aimed to assess local governance aspects of SWPS in the context of sustainability transition from two perspectives: internal niche management and local actors. We assessed nine SWPS projects in Yogyakarta Province, Indonesia, using structured interviews that were analyzed using descriptive statistics and qualitative content analysis. The results showed that the discontinuation of support made SWPS unsustainable, operating only for an average of 4 years. Crucial operational factors included electrical damage, insufficient training, and lack of funds for damage repair. The iterative process of learning, network building, and vision did not eventuate. SWPS have direct benefit on the water supply; however, technological performance feedback related to the karst environment was insufficiently addressed and the network of actors did not expand to higher levels of local government. SWPS were viewed as an unreliable technology; hence, there was no vision for applying SWPS as a water utility. Solar photovoltaic pumps need strong support to compete with diesel and electrical water utility pumps. To achieve sustainability transition, it is imperative to generate vision, promote policy change, and build committed networks within local government rather than simply replicate the number of project installations.

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Keywords Governance · Indonesia · Sustainability transition · SWPS

23.1 Introduction

Efforts for sustainable transition often begin with niche innovations (Geels & Schot, 2007) carried out in local context and expected to scale up for broader societal changes in a regime selection environment (Schot & Geels, 2008). Many sustainability experiments have been implemented in a societal context with the expectation of substantial sustainability gains in not only environmental but also social and economic aspects (Sengers et al., 2019). Community-scale solar water pumping system (SWPS) is one example of an innovation to create a more sustainable water–energy system. The technology combines a pump that operates on electricity generated by photovoltaic (PV) cells. It is an ideal alternative to electricity- and diesel-based pumps that rely heavily on fossil fuel (Li et al., 2017).

In Indonesia, SWPS have been actively implemented since 1982 (UNESCAP, 1991). However, the total number of projects is unknown and the official evaluation documents are lacking. Data from Lorentz (Lorentz, n.d.), a German supplier of solar pumps, reported approximately 189 SWPS projects across Indonesia during 2005–2021. Figure 23.1 shows the distribution of SWPS projects per province on the bivariate thematic ratio map for electrification (Ministry of Energy and Mineral Resources Republic of Indonesia, 2019) and decent drinking water[1] (BPS Indonesia, 2019). It is shown in the map that SWPS is applied in regions with low electricity and water access, such as Nusa Tenggara Timur (54 projects), as well as regions that have access to both, such as Java Island (19 projects). This provides insight that the SWPS has become an interesting option across rural Indonesia, promising an affordable water supply, energy security, and environmental protection.

To date, the practices of SWPS in Indonesia have not accumulated toward significant adoption of renewable energy (RE). The internal process of innovation to transition has been addressed through a framework of strategic niche management, that is, governance approach to create favorable environment to enhance further development of new technology (Kemp et al., 1998; Schot & Geels, 2008; Seyfang et al., 2014; Smith et al., 2016). Transformations of multiple projects at local level require aggregation, coordination, and adjustment to propel the technological trajectory of this emerging field (Geels & Raven, 2006) as illustrated in Fig. 23.2. Transition from a niche innovation to a broader application needs support in the form of wider institutional changes and system innovations by a variety of participants and across governance levels, from national to regional and local (Dobravec

[1] Decent Drinking Water = Drinking water with a minimum distance of 10 m to a waste disposal site sourced from pipes, drilling wells/pumps, protected wells, protected springs, including rainwater; it does not include bottled water, water from street vendors, water sold through tanks, well water, or unprotected springs [8].

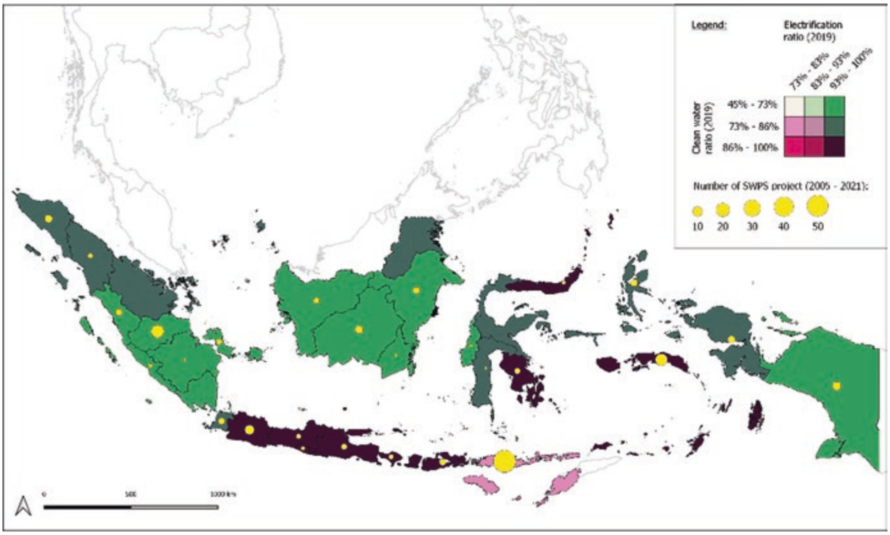


Fig. 23.1 Distribution of SWPS projects in the bivariate map of electrification to decent drinking water ratio

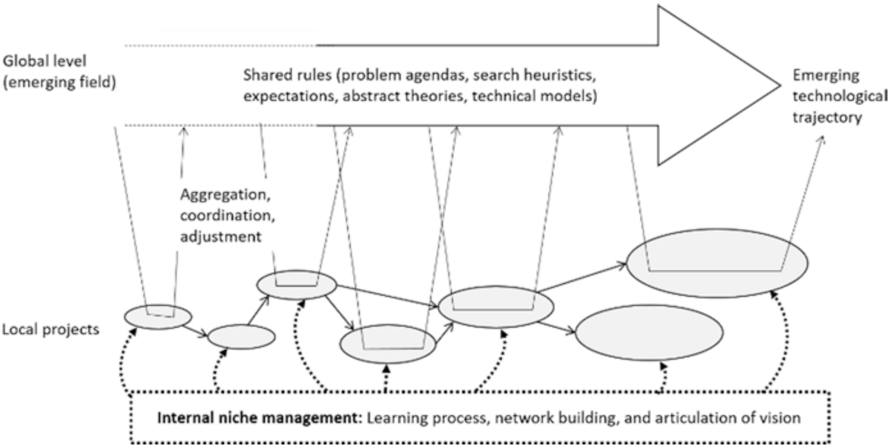


Fig. 23.2 Niche trajectory by local projects. (Adapted from Geels & Raven, 2006)

et al., 2021). Continuing support from an institution is one of the important factors to sustain community energy projects (Rahmani et al., 2020).

As a niche innovation, SWPS have hardly moved from experimentation to mainstream adoption in the water utility sector. In the Local Government Water Utility's (PDAM) energy efficiency guidelines and strategic plan of 2018–2022 (Ministry of Public Work Republic of Indonesia, 2014, 2017), there is no specific plan to adopt SWPS nor RE. Several PDAM had considered using solar power (PERPAMSI,

2016; Samudra, 2021); however, to the best of our knowledge, none is yet to be built. Energy aspect is crucial because PDAM has issues of unstable power supply from the national grid (Nurmalia et al., 2006). Energy is needed at every stage of the water service cycle (Plappally & Lienhard, 2012) and often accounts for the largest (approximately 55%) proportion of operating costs (IRENA, 2015). RE, specifically solar PV in water utilities, offers opportunities to improve energy security. One example of this is the Valley Center Municipal Water District in California, where 1.1 MW solar PV was applied to supply 20% of the electricity required by the utility's largest pumping station (IRENA, 2015). However, in Indonesia, throughout almost four decades of experience implementing SWPS, adoption of this technology in water utility operations has not emerged.

Various aspects of SWPS in Indonesia have been studied in the last few years. Most papers explored design analysis, technical challenges, and economic feasibilities, such as in Gunungkidul and Banten (Arifin et al., 2018; Setiawan et al., 2014a, b; Simamora, 2020). Development processes have been evaluated regarding implementation (Primawan & Iswanjono, 2019; Riyanto et al., 2021; Setiawan et al., 2014a, b) and the participation of diverse stakeholders (Wahyuni et al., 2015), which comes from Gunungkidul and Ponorogo. Recently, a paper investigated some socioeconomic impacts of SWPS projects in Gunungkidul (Rahmani et al., 2021). Despite the growing body of studies on SWPS in Indonesia, examination of local governance aspects has not been sufficiently reported. Initiative from government is crucial for growth and development of SWPS, as reported in India, where large-scale implementation took place across country, targeting 1 million SWPS by 2021 (Rathore et al., 2018). In Indonesia, there is a gap in literature about SWPS in the context of governance aspect and sustainability transition into a broader water utility application.

This study aimed to assess local governance aspects in SWPS in the context of sustainability transition. We define local governance at two levels: internal niche management and local actors, including local government and the implementing organization. We argue that the lack of a supportive environment from local actors contributes to the unsustainability of SWPS in the water utility sector. To show this, we test our hypothesis in a case study. We selected Gunungkidul Regency in Yogyakarta Province, because several institutions there have actively implemented SWPS during 1986–2017. The district comprises a rural region (94%) (BPS Kabupaten Gunungkidul, 2019) and has a karst landscape, which is formed by the dissolution of carbonate rocks, and prolonged water issues. High rock solubility results in caves and extensive underground aquifers (Bakalowicz, 2005). Water is sourced from caves, deep wells, or springs that are often off-grid and far from settlements. SWPS project was expected to solve the water problem. The projects were replicated in many villages, but some local articles reported that systems became fully nonfunctional after several years of operation (Kusuma, 2008; WKM, 2009). Official documents concerning the evaluation and performance status were lacking. We investigated nine SWPS projects and interviewed community-based organizations (CBOs), the implementing organizations, village and subdistrict leaders, and local governments, and conducted a qualitative analysis of their responses.

The novelty of this paper is based on two key points. First, it fills the gap in the current literature dedicated to community-scale SWPS regarding the major issue of support systems that enable sustainability transition. Second, the research is innovative in taking the perspective and analysis of institutional arrangements from each actor in the local stakeholder cohort. As a study case, SWPS in Gunungkidul represents the typology of small-scale (<1 MW) solar PV for productive use, specifically for rural community water supply. Worldwide, India has been the major implementer of SWPS for agricultural farms (Chandel et al., 2015), while in developed countries, the applications are commonly for ranchland, livestock, and vacation homes (Meah et al., 2008a, b). As an RE technology, SWPS produces the direct benefit of water, not electricity. Therefore, the technology performance is strongly associated with an underground aquifer and challenging environmental conditions such as the karst landscape of Gunungkidul.

23.2 Analytical Framework

To the best of our knowledge, scholars have not assessed SWPS in Indonesia through a niche management framework and the institutional arrangements of local actors; hence, we decided to add these considerations in the research as shown in Fig. 23.3. We hypothesized that the lack of a supportive environment, from local actors to internal niche, leads to SWPS malfunction and eventually difficulty in adopting the technology. The first level of analysis is the internal niche. The definitions of niche management process are as follows: (a) *Learning process* includes the articulation of needs, problems, and possibilities at multiple dimensions. (b) *Network building* contributes to niche development when it has diverse actors providing multiple views and can mobilize commitment and resources. (c) *Visions and*

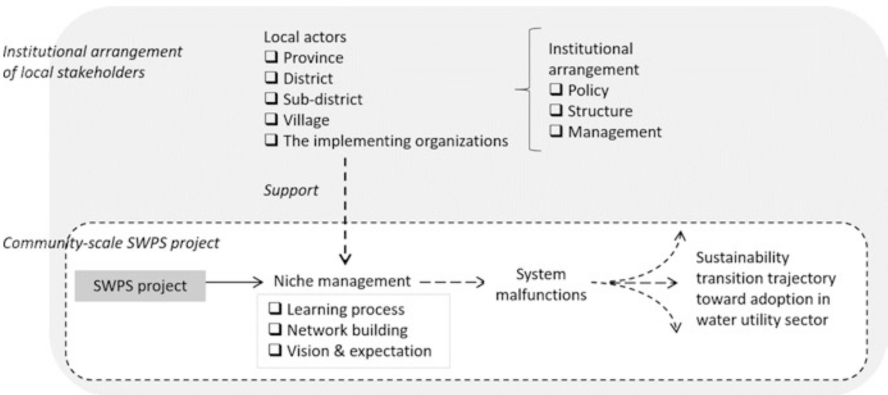


Fig. 23.3 Analytical framework

expectations are crucial to drive the nurturing process and it should be shared among actors (Kemp et al., 1998; Schot & Geels, 2008; Seyfang et al., 2014).

The second step of analysis is the connection of niche with the institutional arrangements of local actors. In our analysis, local actors consist of local government and the implementing organizations. Since the democratizations process in 1998, central government has decentralized many of its function to local government, which is divided into autonomous provinces, districts (or regencies, *kabupaten*), and municipalities (*kota*) (Usman, 2001). In districts comprising rural areas, there are smaller government administrative units called subdistricts (*kecamatan*) and villages (*desa*). To fully understand the context, we added an important actor in the SWPS process: the implementing organizations that drive SWPS development, such as universities, nonprofit organizations (NPOs), the national agency, and international donors. We analyzed the actors' governance aspect based on three indicators: policy, structure, and management. The definitions are as follows: (1) *Policy and institutional mandate* is how government follows a certain method to achieve the desired result; (2) *Structure* means allocation of responsibility and budgeting; and (3) *Management* focuses on the government's relationship with society, particularly in regard to engaging in SWPS issues (Boesveldt et al., 2018; Smits et al., 2011). Our findings are intended to encourage decision-makers to create favorable local governance arrangements and policies that continuously support SWPS to achieve sustainable transition.

23.3 Methodology

This study employed a qualitative analysis using deductive and inductive approaches. Primary data were collected through face-to-face interview and distributed questionnaire to a total of 18 people. We visited nine projects from GK1 to GK9 (see Table 23.1) and interviewed face to face with one representative from each

Table 23.1 List of projects and their status

Project initials	Implementing organizations	Years operating	Status in 2021
GK1	International donors & national agency	10 years (1986–1996)	Not functioning
GK2	National agency	9 years (1999–2008)	Not functioning
GK3	National agency	1 years (2006–2007)	Not functioning
GK4	National agency	4 years (2008–2012)	Not functioning
GK5	National agency & university	1 years (2014–2014)	Not functioning
GK6	NPO & international donors	4 years (2014–2018)	Not functioning
GK7	NPO & national agency	5 years (2014–2019)	Not functioning
GK8	University & NPO	1 years (2016–2016)	Not functioning
GK9	University & NPO	3 years (2017–2021)	Half-functioning

CBO. CBO is a group composed of community members who managed the SWPS. They bear the responsibility of doing daily operational, maintenance, water distribution, and coordination. We also collected data from local actors that were province agency, district department, subdistrict government, village government, and implementing organization. Data from several actors were gathered using a survey questionnaire comprising open-ended response questions, which was distributed by email in consideration of respondents' convenience. The list of informants is presented in Appendix 23.1. When used as sources in Results and Discussion, the interview coded numbers are stated in the text inside the square brackets, for example, [10] refers to the interview with province agency.

Interviews with the CBO representatives were held from March 2–7, 2021, and those with the external institutions from July 22 to September 2, 2021. The list of questions was constructed beforehand, which consisted of open questions about issues relating to the research questions and the challenges of energy generation transition, for example, development process, operations and maintenance, system malfunctions, support from external stakeholders, policies, institutional arrangement, and overall impression of the project. Face-to-face interviews were recorded and transcribed for the analysis. All quotations attributed to the interview are anonymized and masculine personal pronouns are used throughout.

Data analysis contained two major steps. First, the co-occurrence analysis of niche management used the transcribed interviews from each CBO representative. Codes were defined according to insight derived from interview and then aggregated into the theoretical concept of niche management. Qualitative data analysis software, ATLAS.ti, was used to generate code co-occurrence coefficients. The c-coefficient indicates the strength of the relation between two codes from 0 to 1, where 1 means the codes cooccur wherever they are used (ATLAS.ti, n.d.) and is calculated as follows:

$$c = n12 / \left(n1 + n2 - n12\right),$$

where $n12$ = number of co-occurrences for codes $n1$ and $n2$. Then, the coefficient is divided into three intervals, namely, strong, intermediate, and weak relationship.

Second, in the analysis of institutional arrangements, we carried out qualitative analysis from the transcribed interviews and open-ended questionnaires from local actors. Data from the questionnaire were labeled and categorized according to the three indicators: policy, structure, and management. We present the results in three categories: (1) *strong* means the variable is fully present in relation to SWPS; (2) *intermediate* is when the variable is present but not aligned with SWPS; and (3) *weak* means the variable does not present at all. The result was triangulated with regulations, laws, and other secondary data to ensure accuracy in observation. Figure 23.4 shows the method flowchart.

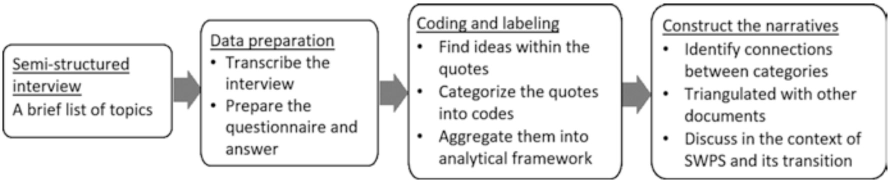


Fig. 23.4 Method flowchart

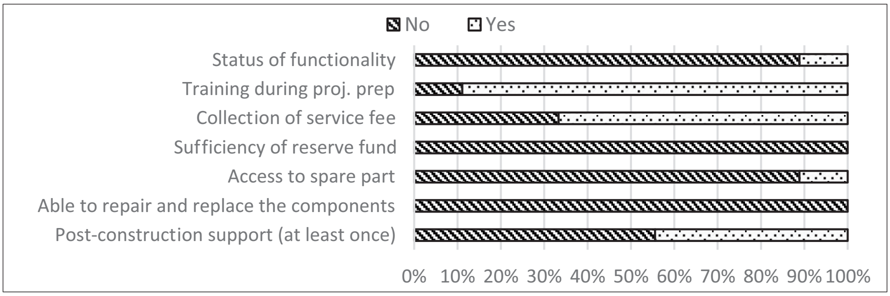


Fig. 23.5 Project overview

23.4 Results and Discussion

This section is presented as follows. First is the analysis of niche management followed by the institutional arrangements of local actors. At the end, challenges to sustainability transition are presented by combining both analyses. Results are shown in the early paragraphs, followed by discussions and references from literature.

23.4.1 Niche Management Analysis of Solar Water Pumping Systems

Figure 23.5 captures the survey results regarding the overview of the project, functionality, and the supporting environment of SWPS, such as the service fee, reserve funds, spare parts, and support from the implementing organization.

All projects were implemented through the involvement of the external institutions and donors. In the majority, the community participated in public meetings and physical construction. The project was later handed over from the implementing organization to the local community, giving them full responsibility for operations and maintenance. Local government, from province to village level, never built any SWPS (Fig. 23.6). Problems emerged with the project performance. The majority of SWPS (8 of 9 or 89%) are currently not functioning. From Table 23.1, it is shown

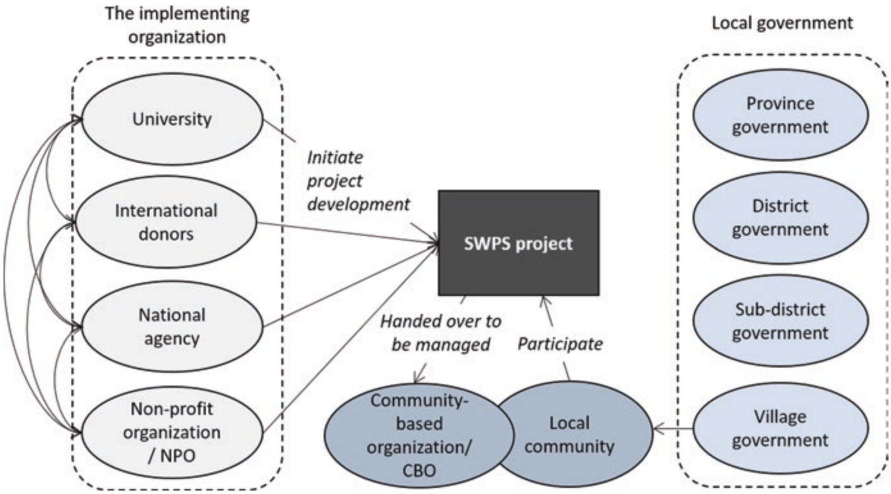


Fig. 23.6 Relationships among actors during SWPS project development

that the average SWPS lifetime was 4 years. An accumulation of many factors caused the projects to be stopped. From the interviews, we classified the code, sub-code, and abstract into niche management factors (Table 23.2) and the coefficients of co-occurrence in Fig. 23.7. Damage to the electrical components was frequently associated with the need for repair support (0.27) and a lack of reserve funds for repairs (0.19). Moreover, the community needs the support because of the insufficient training they had received (0.20). Throughout the experience on managing the SWPS, they felt the system failed to deliver the expected performance, which was associated with their preference for an electric utility (0.21).

This section explains the niche management through the indicators of system malfunction, learning process, network building, and vision.

System malfunction. SWPS has multiple parts that are exposed to inclement conditions such as bad weather, changes in water level, and human manipulation; therefore, mechanical wear and tear is inevitable. While the design system of each project is different, in general, the pump and controller are the most prone elements of the system. Six projects mentioned problem in the pump (GK1, GK2, GK4, GK6, GK7, GK8) and three projects mentioned problems in the controller/inverter (GK3, GK5, GK 9). Malfunction resulting from theft happened at GK 1 and GK4. In the case of Gunungkidul, most of the SWPS locations are near to the water source, caves, and forest, far from the community settlement. Theft caused electrical burnouts, which exacerbated the malfunction. Longevity of the SWPS requires efforts in the repair and replacement of elements when malfunctions occur.

The controller contains sophisticated electronics that must withstand various environmental conditions while isolating the solar PV array from the pump for safety and providing the pump with optimum voltage (Meah et al., 2008a, b). A controller that incorporates an inverter is needed if an AC pump is used. Ideally,

Table 23.2 Code, subcode, and abstract

Code and subcode	Abstract	Keywords
Learning process		
Insufficient training	The sufficiency of training to increase CBO skill	Training, skill, education, knowledge
Karst region challenge	Environmental challenges due to the karst geographical condition	Sedimentation, limestone, low water level
Minimum operational & maintenance skills	The CBO's ability to conduct operations and maintenance	Maintenance, basic, minor, wiping solar PV
Network building		
Difficult to access spare parts	Access to spare parts	Spare part, access, service
Lack of reserve funds	Adequacy of community funds from the service fee	Fee, fund, cost, expensive, insufficient
Need for support to repair malfunction	The CBO's ability to repair major damage	Repair, help, assistance, major damage
Vision and expectation		
Lack of postconstruction support	Support from the implementing organization after construction	Unclear domain, no support at all
Gap on the expectation	Gap on the expectation and system performance	Expect, dissatisfied
Preference on electric utility	The tendency to choose electric utility because of its reliability	PLN (national electric utility company), durable
System malfunction		
Damage of electrical components	Technical issues with electrical components	Damaged, burnt, stop
Theft	Theft of SWPS components	Theft, stolen

the controller/inverter is scheduled to be replaced after 8–12 years (Welsien & Hosier, 2015); however, the average lifetime of the SWPS in Gunungkidul was only 4 years, far below other reported cases that had been in operation for 10 years in Mexico (Foster et al., 1998) and 15 years in Wyoming, USA (Meah et al., 2008a, b). In other words, the system deteriorated faster than the expected replacement time. Routine operational maintenance faces a huge barrier when there is no support system in the region; hence, the SWPS quickly become fully nonfunctional.

Learning Process The SWPS project was developed with strong collaboration between external actors and the community. During the project preparation stage, most of the CBOs (89% or 8 of 9 cases) received training in operations and maintenance. The most common training involved wiping the solar panels and checking the pipe [2], [5], [7], [8], [9]. Some CBOs received more advanced training such as GK9. All CBOs said they had insufficient skills for conducting higher level maintenance, such as repairing the pump. Our data show insufficient training to be strongly associated with the need for assistance when malfunctions occur (c-coefficient = 0.20).

		Learning process			Network building			Vision and expectation			System malfunction		
		Insufficient training	Karst region challenge	Minimum O & M skill	Difficult to access spare part	Lack of reserve fund	Need of support to repair malfunction	Lack of post-construction support	Gap on the expectation	Preference on electricity utility	Damage of electrical components	Theft	Total
Learning process	Insufficient training	0.00	0.00	0.16	0.08	0.05	0.20	0.09	0.00	0.00	0.09	0.05	0.72
	Karst region challenge		0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.21
	Minimum O & M skill			0.00	0.00	0.00	0.16	0.00	0.09	0.09	0.08	0.00	0.42
Network building	Difficult to access spare part				0.00	0.04	0.08	0.00	0.00	0.07	0.02	0.00	0.21
	Lack of reserve fund					0.00	0.13	0.05	0.04	0.04	0.19	0.00	0.45
	Need of support to repair malfunction						0.00	0.05	0.08	0.16	0.27	0.03	0.59
Vision and expectation	Lack of post-construction support							0.00	0.00	0.00	0.02	0.00	0.02
	Gap on the expectation								0.00	0.21	0.13	0.00	0.34
	Preference on electricity utility									0.00	0.08	0.00	0.08
System malfunction	Damage of electrical components										0.00	0.02	0.02
	Theft											0.00	0.00
Total		0.00	0.00	0.26	0.08	0.09	0.57	0.19	0.21	0.57	0.99	0.10	

Notes: 0.00 – 0.08 = weak relationship; 0.09 – 0.18 = intermediate relationship; 0.19 – 0.28 = strong relationship

Fig. 23.7 Co-occurrence coefficients between codes

Continuous learning is needed in order to improve niche growth. This process aspect was glaringly absent at the SWPS Gunungkidul. For most installations, technical damage was not investigated further, as there was no skilled technician to assist the community. Several CBOs mentioned the limestone sedimentation that caused damage in the pump [6], [8]. Another CBO mentioned pump failure at low water level [2] and experienced rapid corrosion of the solar PV array situated near the coast [9]. Such problems and their solutions need to be included as part of the learning process in order to improve the SWPS' performance.

The hydrological cycle in karst aquifers has high heterogeneity and is organized by groundwater flow, which needs to be monitored continuously (Bakalowicz, 2005). Learning from several limitations in the field, adjustment in the design technology might be needed to achieve optimum performance and the standardization of best practices (Geels & Deuten, 2006). Difficulties finding skilled human capital within Gunungkidul amplify the urgency to bring technical support and on-going professional advice from outside. Gunungkidul has the lowest Human Development Index among other regions in the province (69.98 of 100) (BPS Provinsi Daerah Istimewa Yogyakarta, 2020). The findings in our case studies align with those reported by UNESCAP (UNESCAP, 1991). It is feasible to operate SWPS by unskilled personnel; however, skilled engineers are needed for regular technical maintenance. SWPS require monthly maintenance checks and annual high-level back-up and support.

Network Building The existing SWPS network is operated among the CBO, the implementing organization, and village government. As the driver of development, the implementing organization is expected to deliver assistance. Our research indicates that 89% (8 of 9 cases) do not have direct access to spare parts, meaning they depend on the implementing organization to facilitate the contacts. The majority of CBO representatives said that the spare parts were from outside the province, for example, Surabaya or Semarang, or from the capital city of Jakarta. The pump has been imported from overseas, for example, Lorentz from Germany and Franklin from the United States.

According to those interviewed, almost half of the cases (44%) received support at least once in postconstruction phase. When the institution was willing to facilitate the repairs, the community decision was constrained by limited funds. The collection of user fees became necessary in order to cover the cost of repair. Even though most of the projects (67% or 6 of 9 cases) had collected a service fee, all cases (100%) reported that the reserve fund was insufficient to cover the repair and replacement of components. The fund was only adequate for minor problems, such as fixing broken pipes or to buy battery water. The cost of a replacement unit is far above the community fund. The socio-economic background of the communities, where many are farmers and day-laborers, makes it difficult to collect additional money. Therefore, component failures were not fixed and SWPS operations were not restored.

These findings highlight three consequences. First, the network is not developed between CBOs and higher local government or broader actors. The CBOs heavily rely on the implementing organization for assistance, such as searching for replacement spare parts. Second, the unavailability of spare parts at a local level means that repair times will be significantly extended because the components have to be shipped from outside the country. Third, although operational cost is very low, if any maintenance costs do happen, then SWPS require relatively expensive items such as a replacement pump or controller/inverter (Hjalmarsdottir, 2012); this causes the repair costs to be higher than other water supply systems (UNICEF, 2016). To date, credit from financial institutions or government is not available.

Vision and Expectation The SWPS, as a new technology in the Gunungkidul Regency, was built with an expectation of cheaper water service and minimum operational cost compared with diesel-powered pumps. A lack of commitment was evident in some projects where assistance from the implementing organization was not available at all (56%: GK1, GK2, GK3, GK5, GK8). The difficulties of project management affect the community's perception about the RE system and preference for an electrical or diesel-powered water utility. The CBOs have a strong interest in electrical utilities (c-coefficient = 0.21) because they are easier to maintain [5], [6], [7], [9] and they believe they are able to manage these units with their minimum skill (0.09) and without external support (0.16).

The promise of technological performance is an essential part of niche development (Kemp et al., 1998). However, having an accumulation of the above problems, the SWPS became unreliable and did not meet the users' expectations. Electric utilities, as an incumbent technology, have the benefits of far longer time in development and offer convenience of use, lower cost, infrastructure, maintenance network, and regulation (Smith, 2007; Smith et al., 2016); hence, conventional electrical utilities have higher reliability and greater longevity.

23.4.2 Analysis of Institutional Arrangements of Local Actors

The institutional arrangements vary for each stakeholder in the context of SWPS management and its transition (Table 23.3). The following discussions refer to the contents of table by row number and column, respectively, in brackets; for example, (1, 2) refers to the province agency's roles and responsibility.

Province Agency Institutional mandates play an important part in government roles and function to conduct certain programs with a particular approach. In Yogyakarta Province, responsibility for the energy sector is on the province level (1, 1). The province does not have SWPS assets and they never built the system. The province government perceives that solar PV for the water sector is currently not effective due to its high initial investment cost and the electricity produced is intermittent. Hence, the province level focuses on solar PV utilization for electricity generation and not water pumping.

Yogyakarta Province has produced a "Regional Energy Plan 2020–2050" (Government of Yogyakarta Province, 2020) that consists of a vision, mission, goals, targets, and strategies for regional energy management. The plan plays a major role as a guideline for local government, municipalities (*kota*), and districts (*kabupaten*) to develop a strategic plan, coordinate across sectors, and for the public to participate in energy sector decisions. From the perspective of RE, the plan mentions installation of solar PVs on building rooftops in government offices, commercial buildings, industry, and public facilities. Because the SWPS is not stated in the program, the province government's involvement, budget allocation, and initiative in the issue are limited (1, 2; 1, 3; and 1, 4, respectively).

District Department There is no department that manages energy sectors at the district level (2, 1). District departments are responsible for water services that use an electric utility or diesel, and do not consider RE as an electricity source. There is no clear mandate to implement RE in the water sector and RE development is outside the district's scope of responsibility; therefore, local departments only focus on water supplies (2, 2). There is no allotted arrangement in APBD (Regional Fund) for RE projects (2, 3). In the DAK (Special Allocation Fund), which the national government transfers to municipalities and is earmarked for national priorities, the allotted arrangement is for the water network and not RE or solar PV. Initiatives for collaborative works in SWPS are absent (2, 4).

Table 23.3 Institutional arrangements in the context of SWPS implementation and transition

		Policy and institutional mandate	Roles and responsibility	Budget and financing	Initiative to engage with other actors
		1	2	3	4
1	Province agency	◘ Authorize energy sector. Policy about solar PV, but no policy about SWPS	◘ Responsible to implement RE but only limited to the policy (solar PV rooftop)	◘ Budget allocation for RE according to the policy (solar PV rooftop)	○ Not initiating the collaborative work
2	District department	○ Do not have authority to energy issue because it is province's scope	○ Regional program is focusing in water supply provision	○ No allotted arrangement for RE technology	○ Not initiating the collaborative work
3	Sub-district government	○ No specific policy	○ No specific roles	○ No allotted budget	○ Not initiating the collaborative work
4	Village government	◘ Possible to create policy based on village's priority	● Have responsibility to manage assets in their area	◘ Possible to use village funds based on village's priority	◘ Directly engages with CBO, but yet to broader actors
5	The implementing organization	◘ Have a low-carbon agenda, but no specific mandate to continuously support SWPS after handover	◘ Have roles to do experimentation and community service but lack of continuity	◘ Have budget allocation but lack of continuity	● Have broad network and prior experience to engage with many actors

Notes: ●: strong, ◘: intermediate, ○: weak

District government focuses on two programs of the water sector in the Gunungkidul: PDAM in urban areas and the "Water Supply and Sanitation Program for Low-income Communities" (Pamsimas) for rural areas. PDAM has a small part of its systems that uses RE technology but this was a pilot project implemented by external actors (BPPT, 2016; Nestmann et al., 2013).

Pamsimas, a national program initiated by the World Bank and government of Indonesia in 1993, is developed in collaboration between community demand and government institutions (The World Bank, 2014). Arguably, there is a possibility to use solar PV in the Pamsimas program. However, budget allocation per project, which is approximately IDR 240 million (17,000 USD), is inadequate. Additional funding opportunities from the district budget are also limited.

Sub-district Government Sub-district level has the role of "guidance (*pembinaan*) and supervision (*pengawasan*) of village activities" according to Law Number 23/2014 about Local Government. Their work facilitates development planning

meetings and oversees village activity. The sub-district's policies, roles, and initiatives in SWPS activities are minimum (3, 1; 3, 2; and 3, 4, respectively). They also do not have an allotted budget for direct activities such as SWPS management (3, 3).

Prior research stated that there are challenges due to the lack of capacity in the staff, who commonly carry out purely administrative roles (Syukri, 2016). The research mentioned one of the causes is the absence of detailed regulation about the function and authority of sub-district staff in assisting village governments.

Village Government Village government has the strongest roles and responsibility to manage SWPS compared with other government levels (4, 2). When an SWPS project is built in their territory, the village government is expected to manage the system [10], [11], [17], [18]. Because the Law Number 6/2014 about "Village" is in force, the village has greater roles and authority to govern autonomously (4, 1). In terms of funding, the national government provides a Village Fund (*Dana Desa*) and district government allocates some budget as well (4, 3). The village does not put SWPS on the priority for an allotted budget due to several considerations. The first derives from the "Vision" section: the SWPS has failed to meet expectations and seems to not be a reliable system; therefore, the village prefers to build a water supply system based on an electric utility or diesel rather than repairing the SWPS. Second, the SWPS has been nonfunctional for a relatively long time; hence, the deteriorated systems require more funds than budgeted.

Regarding engagement among actors in SWPS management, we found that village government, which is the lowest government unit, is the only level that directly collaborates with the CBOs that manage SWPS and with the implementing organization (4, 4); however, village governments have yet to actively seek broader opportunities to sustain the SWPS. The upper government levels, that is, the province agency, district department, and subdistrict government, are relatively passive and do not initiate collaborative work although they said they are willing to facilitate and coordinate a proposal if any [10], [11], [12], [13].

Implementing Organization The implementing organization has technical expertise, resources, and networks to engage with many actors (5, 4). While each institution has different specific policies, in general, they want to materialize the potential of RE as a low-carbon technology in rural areas through pilot project experimentation or community service (5, 2). However, such programs often periodically change and do not possess the grand vision and design, making the outcomes of the allotted budget uncertain (5, 3). In all the case studies, when the SWPS construction is finished and the CBO established, the mandate to sustain the SWPS is handed over to the CBO and village government (5, 1), leaving the villagers to struggle with technical malfunctions. A clearly defined and written contractual arrangement is needed to clarify each party's responsibility (Smits et al., 2011).

23.4.3 Challenges of SWPS Sustainability Transition

Over almost the last four decades, Indonesia has been unable to successfully implement SWPS in the water utility sector. Using an empirical case set of SWPS at Gunungkidul Regency, our analysis focused on local governance, starting with the dynamics of internal niche management and then the connection to the institutional arrangements of local actors.

The drivers of SWPS development in Gunungkidul are the external implementing organizations that come from diverse backgrounds: the national agency, international donors, universities, and NPOs. The initial cost of SWPS is beyond the affordability of the rural community, province and district governments' budgets; hence, none of the projects in Gunungkidul were initiated or developed locally. After construction finished, the SWPS was handed over to the CBOs, bearing them with the responsibilities of management, operations, and maintenance. Community-level organization has been a common approach for rural water supply system in Indonesia through Pamsimas program, which has achieved several success cases of improved water, sanitation, and behavior change (The World Bank, 2014). Rural communities in Indonesia, especially in area having higher scarcity or resources and geographic isolation, commonly have strong cooperation and social ties (Subejo, 2009).

During the preparation stages, eight of the nine CBOs (89%) received training. However, to assume that training would equip the CBOs with enough skill independently is over-simplistic, moreover SWPS uses advance technology, not a conventional pump. System malfunctions cannot be handled by the CBOs; as a result, the average project lifetime was only 4 years. Through co-occurrence analysis, we found that the technical damage is related to CBOs' need for repairs support (c-coefficient = 0.27) and lack of reserve funds for repairs (0.19). They also need the support due to the lack of training they had received (0.20).

During the management of SWPS, steps for nurturing the niche into sustainability transition were not taken. The ideal situation is when the institutions involved in project preparation commit and support the sustainability of the niche. However, from an analysis of institutional arrangements, it is apparent that their policy mandate, level of responsibility, and financing are not aligned to continuously support SWPS. Hence, their assistance was discontinued. The Yogyakarta province agency and Gunungkidul district department were never drivers of the SWPS development; therefore, they perceived the installations to be outside their scope of responsibility. At the local government level, networks only exist within the village government as the closest government unit to the CBO.

Without a supportive environment, SWPS, as a niche innovation, was unstable and unsustainable. The barrier of niche adoption in relation to the karst case-specific problem also needs to be properly addressed. The study area of Gunungkidul Regency is challenging for the exploration of and lifting of water to the surface, as said by district departments and implementing organization. Reflecting on the rapid deterioration of electrical components, the karst environment is arguably one of the

contributing factors to SWPS not meeting expectations in terms of longevity. Interviewees mentioned the problems associated with limestone sedimentation and low water level, which are typical in a karst environment. Karst formations develop a distinct hydrological system that needs specific exploration techniques and approaches (Hartmann et al., 2014). Future design configurations should consider such issues to improve SWPS durability.

The local government has acknowledged the benefit of RE and shown interest in applying the technology, as shown in the "Regional Energy Plan 2020–2050" of Yogyakarta Province. However, they are yet to involve in water-energy sector and SWPS field. From the interview, several barriers existed, such as huge initial investments, perceived uncertainties of technological performance, and limited public funding [10], [11], [12]. Unavailability of a supportive environment has made it difficult for SWPS to compete with incumbent technology, in this case, diesel, and electric utility pumps. Circling back to the vision in project planning, this raises a question regarding how long the SWPS is expected to last and whether it is regarded as an interim condition prior to grid electrification (Kumar et al., 2019). Small-scale SWPS in Gunungkidul are unable to fulfill the vision of a reliable water supply. Consequently, visions to apply solar PV in regional water utilities have not yet emerged.

These above findings reflect three points. First, supportive policy environment that promotes SWPS is unavailable in the municipality; as a result, any initiative to build community-scale SWPS project could not be integrated into a certain grand plan, and eventually received little support from the municipalities. Further, when a project successfully implemented, there is a deeper structural problem regarding the tendency to deliver early quantitative, measurable results instead of performance and empirical impacts feedback (Derks & Romijn, 2019). Second, as initiator, the implementing organizations have been focused on replicating SWPS installations rather than on building networks with local government and bridging policy change. Political harmonization and support is extremely crucial, including stakeholders' engagement, creating forums gathering the actors, routine meeting and consultation, that induce progress in policy framework (Sovacool, 2018). Third, province and district governments have not demonstrated an adaptive governance approach toward SWPS installations as an opportunity to initiate more action or strategic intervention in low-carbon development. Study conducted by Morita et al. (2020) mentioned that local government level of Indonesia has several challenges to achieve sustainable development goals, that are the lack of a coordinated system involving multiple stakeholders, inadequate capacity, experience, resources, and data for implementing and reporting. Shortcoming in local level is arguably related to the perception that national authorities is seen as driving forces of renewables (such as Ministry for Energy and Mineral Resources and state electricity company, or PLN), however the lack of coordination between national and subnational decision makers also exist (Marquardt, 2014).

Delegation from national mandate, such as declaring in national plan the obligation to adopt SWPS in water utility, will not necessarily achieve success in the implementation of sustainability transition. For a local innovation to be successfully

adopted in a broader environment, significant changes are required in the institutional and governance aspect. Transition management is an iterative process (Loorbach & Rotmans, 2006), in the process of learning, systematic monitoring, and evaluation. The intention to scale should be in stakeholder's mindset and part of the design to assess the scalability of innovation. Then, the decision to scale is based on the evidence, whether the desirable result is achieved and has potential to expand (Holcombe, 2012). This is not exclusive in our case about the transition of SWPS technology into water utility, but also in general local RE project that dreamed to pioneer regional energy transition. A dedicated institution has to be in place to facilitate the transition process. RE in general has a barrier to high upfront cost, perceived technology performance uncertainty, and risk (Vallecha et al., 2021). Hence, a strong leadership and committed institution who willing to take risk and advocating change is very crucial (Sovacool, 2018). Due to limited public finance, private sector investment will be very important. In essence, the efficacy of transition needs capacity building, stakeholder participation, policy alignment, technological learning, and continuous support commitment.

23.5 Conclusion

SWPS in Indonesia has been developed as a community-scale project since 1982; however, the technology is yet to be adopted in the water utility sector. Through the lens of governance, we addressed this problem through an analysis of internal niche management and local actors' arrangements using a case study in Gunungkidul Regency. Our data on SWPS projects between 1986 and 2017 show that the average lifetime of the nine SWPS projects was 4 years. The discontinuation of support by implementing organizations meant CBOs struggled to overcome system malfunctions. The interviewees repeatedly mentioned that damage to the electrical components was frequently associated with the need for support in order to repair equipment and a lack of reserve funds. The community needs this support due to the insufficient training they received. The iterative process of learning, network building, and articulation of vision was not pursued. Challenges to the adoption of SWPS in a karst environment were insufficiently addressed. The network of actors did not extend to higher local government levels (province and district), whereas at the same time, their initiative to engage was also limited. Responsibility rested on village government as the closest government unit to the CBO; however, there was reluctance at this level to prioritize village funding for SWPS, because it had failed to meet their vision. As an internal niche, SWPS is seen as unstable and unsustainable by CBOs and local government; accordingly, there is no vision to apply the technology to the larger water utility.

Solar PV pump technology needs stronger support to compete with diesel and electric utility pumps in the water utility sector. To achieve sustainability transition, supportive policy promoting RE-water sectors should be in place, and more efforts

on building vision and committed networks in local actors rather than replicating the number of installations. Transition management is an iterative learning cycle; hence, the involved stakeholders need to be dedicated to facilitating and assisting the process. Using insight from our analytical framework and the Gunungkidul case, it could be helpful for parties to identify similar cases of community-scale RE projects in rural settings.

We consider the following limitations in our research. First, we did not explore diverse aspects such as the market, industry, science, culture, and infrastructure. Second, we did not delve into the national and local linkage of water–energy policy. Future research in this area will strengthen the argument about the SWPS development trajectory from a multilevel perspective. Sustainability transition is a continuous and long-term effort that needs a combination of strength and commitment from different level of government structures, from national to local level.

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Appendices

Appendix 23.1: List of Informants

Category	Number of Interviewees	Number Initials	Method of data collection
CBO (local community)	9	[1], [2], [3], [4], [5], [6], [7], [8], [9]	Face-to-face interview
Province agency	1	[10]	Distributed questionnaire
District department	2	[11], [12]	Face-to-face interview
Subdistrict government	2	[13], [14]	Face-to-face interview
Village government	2	[15], [16]	Face-to-face interview
Implementing organization	2	[17], [18]	Distributed questionnaire

Notes:

(a) Initials of CBO correspond to each project locations (i.e., 1 from GK1)

(b) Interviewees from the subdistrict, village government, and implementing organization were purposefully selected from projects GK6, GK7, GK8, and GK9, which were operated most recently in the last 5 years among other projects. The details are as follows:

- [13] correspond to GK6, GK7, and GK9, [14] to GK8
- [15] correspond to GK6 and GK7, [16] to GK9
- [17] correspond to GK8, [18] to GK

Appendix 23.2: List of Abbreviations

APBD	*Anggaran Pendapatan dan Belanja Daerah*, or Regional Fund
CBO	community-based organizations
DAK	*Dana Alokasi Khusus*, or Special Allocation Fund
MW	megawatt
NPO	nonprofit organization
Pamsimas	*Program Air Minum dan Sanitasi Berbasis Masyarakat*, or Water supply and Sanitation Program for Low-income Communities
PDAM	*Perusahaan Daerah Air Minum*, or Local Government Water Utility
PLN	*Perusahaan Listrik Negara*, or state electricity company.
PV	photovoltaics
RE	renewable energy
SWPS	solar water pumping system

References

Arifin, M. L. N. R., Fathani, T. F., & Priyosulistyo, H. (2018). Analysis of life cycle cost in water pumping system in Karst Area (in Indonesian). *Reka Racana, 4*(3), 20–27.

ATLAS.ti. (n.d.). *ATLAS.ti 9 user manual – Windows: Code Co-occurrence coefficient*. https://doc.atlasti.com/ManualWin.v9/CodeCooccurrence/CodeCoOccurrenceTableCcoefficient.html?highlight=code,coefficient#code-co-occurrence-coefficient

Bakalowicz, M. (2005). Karst groundwater: A challenge for new resources. *Hydrogeology Journal, 13*(1), 148–160. https://doi.org/10.1007/s10040-004-0402-9

Boesveldt, N. F., van Montfort, A. J. G. M., & Boutellier, J. C. J. (2018). The efficacy of local governance arrangements in relation to homelessness. A comparison of Copenhagen, Glasgow, and Amsterdam. *Public Organization Review, 18*(3), 345–360. https://doi.org/10.1007/s11115-017-0378-2

BPPT. (2016). *To improve water supply in Gunungkidul, B2TKE develop PV pump technology (in Indonesian)*. http://b2tke.bppt.go.id/index.php/en/109-upayakan-air-bersih-di-gunungkidul-b2tke-garap-pompa-surya

BPS Indonesia. (2019). *Percentage of households that have access to decent and sustainable drinking water service by province 2017–2019 (in Indonesian)*. https://www.bps.go.id/indicator/23/1554/1/persentase-rumah-tangga-yang-memiliki-akses-terhadap-layanan-sumber-air-minum-layak-dan-berkelanjutan-40-bawah-menurut-provinsi.html

BPS Kabupaten Gunungkidul. (2019). *Regional statistics of Gunungkidul Regency 2019 (in Indonesian)*.

BPS Provinsi Daerah Istimewa Yogyakarta. (2020). *Human development index of Yogyakarta Special Province 2020 (in Indonesian)*.

Chandel, S. S., Nagaraju Naik, M., & Chandel, R. (2015). Review of solar photovoltaic water pumping system technology for irrigation and community drinking water supplies. *Renewable and Sustainable Energy Reviews*, *49*, 1084–1099. Elsevier Ltd. https://doi.org/10.1016/j.rser.2015.04.083

Derks, M., & Romijn, H. (2019). Sustainable performance challenges of rural microgrids: Analysis of incentives and policy framework in Indonesia. *Energy for Sustainable Development, 53*, 57–70. https://doi.org/10.1016/j.esd.2019.08.003

Dobravec, V., Matak, N., Sakulin, C., & Krajačić, G. (2021). Multilevel governance energy planning and policy: A view on local energy initiatives. *Energy, Sustainability and Society, 11*(1). https://doi.org/10.1186/s13705-020-00277-y

Foster, R., Cisneros, G., & Hanley, C. (1998). *Life-cycle cost analysis for photovoltaic water pumping systems in Mexico*. In 2nd world conference on photovoltaic solar energy conversion. https://www.researchgate.net/publication/268357801

Geels, F., & Deuten, J. J. (2006). Local and global dynamics in technological development: A socio-cognitive perspective on knowledge flows and lessons from reinforced concrete. In *Science and public policy* (Vol. 33, Issue 4). Beech Tree Publishing.

Geels, F., & Raven, R. (2006). Non-linearity and expectations in niche-development trajectories: Ups and downs in Dutch Biogas Development (1973–2003). *Technology Analysis & Strategic Management, 18*, 375–392.

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy, 36*(3), 399–417. https://doi.org/10.1016/j.respol.2007.01.003

Government of Yogyakarta Province. (2020). *Province Law Number 6/2020 about Yogyakarta Province Energy Plan 2020-2050 (in Indonesian)*.

Hartmann, A., Goldscheider, N., Wagener, T., Lange, J., & Weiler, M. (2014). Karst water resources in a changing world: Review of hydrological modeling approaches. *Reviews of Geophysics, 52*(3), 218–242. https://doi.org/10.1002/2013RG000443

Hjalmarsdottir, E. H. (2012). Solar powered pumping technologies in rural water supply: Case study from Kunene Region, Namibia. *Waterlines, 31*(3), 197–214. https://doi.org/10.3362/1756-3488.2012.021

Holcombe, S. (2012). *Lessons from practice: Assessing scalability*. www.worldbank.org

IRENA. (2015). *Renewable energy in the water, energy and food nexus*. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_Water_Energy_Food_Nexus_2015.pdf

Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis & Strategic Management, 10*(2), 175–198. https://doi.org/10.1080/09537329808524310

Kumar, A., Ferdous, R., Luque-Ayala, A., McEwan, C., Power, M., Turner, B., & Bulkeley, H. (2019). Solar energy for all? Understanding the successes and shortfalls through a critical comparative assessment of Bangladesh, Brazil, India, Mozambique, Sri Lanka and South Africa. *Energy Research and Social Science, 48*, 166–176. https://doi.org/10.1016/j.erss.2018.10.005

Kusuma, M. (2008). *Advanced equipment are not optimum without human capacity in technology (in Indonesian)*. http://www.ampl.or.id/digilib/read/alat-canggih-tak-optimal-tanpa-bekal-teknologi/

Li, G., Jin, Y., Akram, M. W., & Chen, X. (2017). Research and current status of the solar photovoltaic water pumping system – A review. *Renewable and Sustainable Energy Reviews, 79*, 440–458. https://doi.org/10.1016/j.rser.2017.05.055

Loorbach, D., & Rotmans, J. (2006). Managing transitions for sustainable development. In X. Olsthoorn & A. J. Wieczorek (Eds.), *Understanding industrial transformation* (pp. 187–206). Springer. https://doi.org/10.1007/1-4020-4418-6_10

Lorentz. (n.d.). *References in Indonesia*. Retrieved August 1, 2021, from https://www.lorentz.de/en/references/asia/indonesia/

Marquardt, J. (2014). A struggle of multi-level governance: Promoting renewable energy in Indonesia. *Energy Procedia, 58*, 87–94. https://doi.org/10.1016/j.egypro.2014.10.413

Meah, K., Fletcher, S., & Ula, S. (2008a). Solar photovoltaic water pumping for remote locations. *Renewable and Sustainable Energy Reviews, 12*, 472–487. https://doi.org/10.1016/j.rser.2006.10.008

Meah, K., Ula, S., & Barrett, S. (2008b). Solar photovoltaic water pumping – opportunities and challenges. *Renewable and Sustainable Energy Reviews, 12*(4), 1162–1175. https://doi.org/10.1016/j.rser.2006.10.020

Ministry of Energy and Mineral Resources Republic of Indonesia. (2019). *Press Release Number 642.Pers/04/SJI/2019, 4 November 2019: Grows 3 Percent per Year, Electrification Ratio on Third Quarter 98.86% (in Indonesian)*. https://www.esdm.go.id/id/media-center/arsip-berita/tumbuh-3-persen-per-tahun-rasio-elektrifikasi-triwulan-iii-capai-9886-persen

Ministry of Public Work Republic of Indonesia. (2014). *Energy efficiency guidelines at PDAM (in Indonesian)*.

Ministry of Public Work Republic of Indonesia. (2017). *Strategic plan of agency for improving water utility (BPPSPAM) 2018-2022 (in Indonesian)*.

Morita, K., Okitasari, M., & Masuda, H. (2020). Analysis of national and local governance systems to achieve the sustainable development goals: Case studies of Japan and Indonesia. *Sustainability Science, 15*(1), 179–202. https://doi.org/10.1007/s11625-019-00739-z

Nestmann, F., Oberle, P., Ikhwan, M., Stoffel, D., & Solichin. (2013). Development of underground water extraction system for Karst Regions with adapted technologies and operating system pilot plant in Java, Indonesia. *Procedia Engineering*. https://doi.org/10.1016/j.proeng.2013.03.006

Nurmalia, U., Yulianto, A., & Wacano, D. (2006). *Identification of problems in drinking water supply system in Gunungkidul Regency, Special Region of Yogyakarta (in Indonesian)*. Universitas Islam Indonesia.

PERPAMSI. (2016). *Four PDAMs assessed solar power plant (in Indonesian)*. https://www.perpamsi.or.id/

Plappally, A. K., & Lienhard, V. J. H. (2012). Energy requirements for water production, treatment, end use, reclamation, and disposal. *Renewable and Sustainable Energy Reviews, 16*(7), 4818–4848. https://doi.org/10.1016/j.rser.2012.05.022

Primawan, A. B., & Iswanjono. (2019). Solar water pumping system: Utilization of solar energy for clean water provision in Karang Sub-village, Gunungkidul (in Indonesian). *ALTRUIS, 2*(1). https://doi.org/10.24071/altruis.2019.020106

Rahmani, S., Murayama, T., & Nishikizawa, S. (2020). Review of community renewable energy projects: The driving factors and their continuation in the upscaling process. *IOP Conference Series: Earth and Environmental Science, 592*(1). https://doi.org/10.1088/1755-1315/592/1/012033

Rahmani, S., Murayama, T., & Nishikizawa, S. (2021). Socio-economic impact of a solar water pumping system in a rural community in Indonesia. *Journal of Sustainable Development of Energy, Water and Environment Systems*. https://doi.org/10.13044/j.sdewes.d9.0403

Rathore, P. K. S., Das, S. S., & Chauhan, D. S. (2018). Perspectives of solar photovoltaic water pumping for irrigation in India. *Energy Strategy Reviews, 22*, 385–395. https://doi.org/10.1016/j.esr.2018.10.009

Riyanto, D., Winardi, Y., & Muhsin, M. (2021). Development of agricultural irrigation pump using solar electric energy in Duri Village, Slahung, Ponorogo (in Indonesian). *Agrokreatif, 7*(2).

Samudra, A. (2021). *PDAM interested using renewable energy (in Indonesian)*. https://balitribune.co.id/content/pdam-lirik-penggunaan-energi-baru-ter...

Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management, 20*(5), 537–554. https://doi.org/10.1080/09537320802292651

Sengers, F., Wieczorek, A. J., & Raven, R. (2019). Experimenting for sustainability transitions: A systematic literature review. *Technological Forecasting and Social Change, 145*, 153–164. https://doi.org/10.1016/j.techfore.2016.08.031

Setiawan, A. A., Purwanto, D. H., Pamuji, D. S., & Huda, N. (2014a). Development of a solar water pumping system in Karsts rural area Tepus, Gunungkidul through student community services. *Energy Procedia, 47*, 7–14. https://doi.org/10.1016/j.egypro.2014.01.190

Setiawan, C., Setiawan, A. A., & Sihana. (2014b). *Study of solar water pumping system in Plawan Cave, Giricahyo, Purowsari, Gunungkidul, DI Yogyakarta (in Indonesian)*.

Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. (2014). A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environmental Innovation and Societal Transitions, 13*, 21–44. https://doi.org/10.1016/j.eist.2014.04.004

Simamora, Y. (2020). Utilization design of solar water pumping for clean water in Sukarame Village, Sajira Sub-district, Banten (in Indonesian). *TERANG, 3*(1), 23–30. https://doi.org/10.33322/terang.v3i1.1052

Smith, A. (2007). Translating Sustainabilities between Green Niches and Socio-technical Regimes. *Technology Analysis & Strategic Management, 19*(4), 427–450. https://doi.org/10.1080/09537320701403334

Smith, A., Hargreaves, T., Hielscher, S., Martiskainen, M., & Seyfang, G. (2016). Making the most of community energies: Three perspectives on grassroots innovation. *Environment and Planning A, 48*(2), 407–432. https://doi.org/10.1177/0308518X15597908

Smits, S., Verhoeven, J., Moriarty, P., Fonseca, C., & Lockwood, H. (2011). *Arrangements and cost of providing support to rural water service providers*. http://www.waterservicesthatlast.org

Sovacool, B. K. (2018). Success and failure in the political economy of solar electrification: Lessons from World Bank Solar Home System (SHS) projects in Sri Lanka and Indonesia. *Energy Policy, 123*, 482–493. https://doi.org/10.1016/j.enpol.2018.09.024

Subejo. (2009). Characteristics and functions of labor institutions in rural Java: A case study in Yogyakarta province. *Journal of ISSAAS, 15*(1), 101–117.

Syukri, M. (2016). *Peran Kecamatan dalam Pelaksanaan UU Desa (in Indonesian)*. www.smeru.or.id

The World Bank. (2014). *PAMSIMAS: Responding to the water and sanitation challenges in rural Indonesia*.

UNESCAP. (1991). *Solar-powered water pumping in Asia and the Pacific*.

UNICEF. (2016). *Scaling up solar powered water supply systems: A review of experiences*.

Usman, S. (2001). *Indonesia's decentralization policy: Initial experiences and emerging problems*.

Vallecha, H., Bhattacharjee, D., Osiri, J. K., & Bhola, P. (2021). Evaluation of barriers and enablers through integrative multicriteria decision mapping: Developing sustainable community energy in Indian context. *Renewable and Sustainable Energy Reviews, 138*. https://doi.org/10.1016/j.rser.2020.110565

Wahyuni, N. S., Wulandari, S., Wulandari, E., & Pamuji, D. S. (2015). Integrated communities for the sustainability of renewable energy application: Solar water pumping system in Banyumeneng Village, Indonesia. *Energy Procedia, 79*, 1027–1032. https://doi.org/10.1016/j.egypro.2015.11.604

Welsien, K., & Hosier, R. (2015). *Solar water pumping: Ready for mainstreaming?* www.worldbank.org/water%7Cwww.blogs.worldbank.org/water%7C

WKM. (2009). *Many solar power abandoned (in Indonesian)*. https://tekno.kompas.com/read/2009/09/01/15304482/listrik.tenaga.surya.banyak.terbengkalai/

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Chapter 24
Building a Sustainable Photovoltaic Innovation System in Indonesia Through Network Governance Perspective

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Abstract Photovoltaic (PV) is one of primary renewable energy sources aimed to achieve national electrification ratio in Indonesia. There are two PV electricity generators in Indonesia, centralized PV generators (PLTS) and dispersed PV generators (SHS). Both PLTS and SHS are installed in remote and rural areas by which there are no electricity grids provided by state-owned electricity (PLN). The numbers of 15 PLTS/SHS projects are main cases of this study. All of them are categorized based on the type of project and thus analyzed by qualitative research method. This research attempts to investigate PV projects' current progress and formulate a solution to solve the emerging problems. This research found that PLTS/ SHS projects face unresolved classical problems over the years, unsustaining PV projects (e.g., short-life infrastructure due to maintenance capability issue). This study proposes regional innovation system (RIS) and sectoral innovation system (SIS) as the Indonesian comprehensive policy strategy to sustain national PV projects. Network Governance (NG) perspective is a lens to capture how actors of academician, business, government, and community (ABGC) interact and collaborate mutually. The conclusion is that RIS and SIS can create a PV market in Indonesia, possibly being implemented through different NG forms.

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24.1 Introduction

Ministry of Energy and Mineral (Ministry of ESDM) (2018, 2019) reported, Indonesia has potential solar generation energy up to 207,898 MW (~4.80 kWh/m^2/day) and considers photovoltaic (PV) to achieve 100% national electrification in 2022 that currently only utilized less than 0.05%. Government prioritizes new PV infrastructures in uncovered service areas of the state-owned electricity company (PLN), such as remote villages. Establishing PV energy is the nationally strategic renewable energy program that aims at 23% of total energy production from renewable sources in 2025 and will increase to 31% in 2050 (Peraturan Pemerintah No 79 Tahun 2014). It is also part of the Indonesian government's commitment to climate change through the Ministry of Finance (Ministry of Finance, 2021).

The Government of Indonesia and PLN established a centralized PV generation system (PLTS) and a dispersed PV generation system (solar home system/SHS) (Asmara & Mitsufuji, 2017; Boedoyo, 2013). Both systems are beneficial for achieving the national electrification ratio (Boedoyo, 2013) and allowing the communities to extend their activities until night, especially education, social, and economic activities (Retnanestri et al., 2003; Setiawan et al., 2014).

In the last decades, PLTS/SHS projects have been facing continuity issues (see studies of Asmara & Mitsufuji, 2018; Retnanestri, 2007; Retnanestri et al., 2003; Setiawan et al., 2014). There is electricity generation degradation of PV power plants annually (Halimatussadiah et al., 2020), but there are no maintenance mechanism that considers the business model, policy, and community empowerment aspects of PLTS/SHS (Asmara & Mitsufuji, 2018; Hamdi, 2019; Retnanestri, 2007; Setiawan et al., 2014).

PV is a part of sophisticated technologies for solar energy generation (Adityawan, 2010; Durganjali et al., 2020; Halimatussadiah et al., 2020; Retnanestri et al., 2003) and has been studied by scholars from innovation and technology transition perspectives (Asmara, 2018; Kebede & Mitsufuji, 2017; Lo et al., 2013). Development of innovation involves academician, business, government, and community (ABGC) (Carayannis et al., 2012; Ivanova & Leydesdorff, 2014; Kuhlmann et al., 2010). As part of innovation, PV utilization in every country involves diverse stakeholders, including PV technology providers, PV technology users, government, and academicians. Those actors interact with each other in the particular innovation system (see Asmara, 2018; Geels et al., 2004; Kebede & Mitsufuji, 2017; Lo et al., 2013; Strupeit, 2017).

Currently, the continuity of PLTS/ SHS projects in Indonesia emerges as a massive issue in renewable energy discussion. Those projects involve government policy and technology providers, PV technology disseminators, and communities as PV users whose actors stay in a particular innovation system. Kieft et al. (2017) state that an innovation system (IS) is a mutual interaction resulting from

multiactors closely tied by the existing infrastructures and institutions inside as well as strongly influencing the pace and direction of innovation.

PLTS/SHS projects should consider local condition variation such as geographical properties of the location, demography, social, and culture of the community. It needs a regional innovation system (RIS) to ensure the PLTS/SHS continuity projects. Isaksen (2001) and Parto& Doloreux (2004) define RIS as an industrial agglomeration that adopts geographical aspects in the actors' interaction (providers, users, intermediary unit/technology diffusion, and government) in the same region to stimulate economic growth. RIS is like an innovation platform with actual space.

PV industry development requires not solely extensive support from RIS to obtain a market-ready product, because each region has a diverse ability to provide the latest technology. Updated technologies can be provided from other regions. In this sense, a network and interaction among actors from different regions within or beyond the national border are required (Hipp & Binz, 2020). The notion of network and interaction among actors will focus on a specific sector. Sectoral innovation system (SIS) is required to provide a solution to spur PV industry development and to serve as a solid foundation for the region's economic growth (Strupeit, 2017). Like an innovation platform with networks, SIS focuses on a particular industrial sector development by which actors are mutually interlinked, getting through borders of regions/countries (Malerba & Mani, 2009).

RIS and SIS have identical actors that possibly build a connection and trust. In this sense, both systems are virtually connected. RIS has limitations because economic activities and innovation learning resulting from actors' interactions beyond the region border are different in nature(Chung, 2002). Therefore, this study aims to construct a new approach by combining RIS and SIS in developing an IS for PLTS/SHS projects continuity in Indonesia.

ABGC actors are interlinked with each other to create an IS (Casadella, 2018; Geels et al., 2004; Nordfors, 2004). ABGC actors exist at the Indonesian PV development projects, they are Ministry of ESDM, Ministry of Village, local government agencies (government), the state-owned electricity enterprise (PLN), PT INTI, PT LEN, and other electricity state enterprises (business), universities and public research & development (R&D) institutes (academician), as well as nongovernment organizations (NGOs) and local communities (society) (Asmara, 2018; Asmara & Mitsufuji, 2017; Setiawan et al., 2014).

Government and business are dominant actors to build public-funded projects of PLTS/SHS in Indonesia (Asmara & Mitsufuji, 2018). Due to limited governmental resources, involvement of nongovernment actors is required to provide public service optimally, such as society and academician (Rhodes, 2017; Valkama et al., 2013). Electrification service to rural inhabitants through PLTS/SHS projects could not be delivered by Government of Indonesia and business efficiently. Retnanestri et al. (2003) and Retnanestri (2007) revealed that academicians and local communities should be intensely involved to sustain PLTS/SHS projects in Indonesia.

The existence of government and industry to develop PLTS/SHS projects need to be connected to local communities and academician through RIS and SIS to achieve the goal of sustainable PLTS/SHS projects in Indonesia. Geels et al. (2004) reveal

that governance of various actors is a key aspect to IS leading to sustainable aspect. Sørensen & Torfing (2007); Torfing (2007) provide network governance (NG) perspective as an appropriate lens to capture how government and nongovernment actors are involved in addressing public issues coherently. Those actors are mutually interlinked to solve public problems; they are still autonomous and independent actors, not influenced by other actors.

Studies of utilization, sustainability, and transition of PV technologies in many countries are mostly on IS as a whole (see (Hipp & Binz, 2020), singly SIS approach (see (Strupeit, 2017), and technological innovation system (TIS) (see (Esmailzadeh et al., 2020; Hanson, 2018; Kebede & Mitsufuji, 2017; Shubbak, 2019). There are no studies on using SIS and RIS concepts combined with the NG perspective on PV innovation development. Therefore, this study fills the conceptual and practical gap of previously existing PV innovation studies. This study aims to answer two main questions: 1) What are the current issues of PLTS/SHS development projects in Indonesia? How is an innovation system of PLTS/SHS projects built through NG perspective in Indonesia?

24.2 Literature Review

24.2.1 Sustainable Issue and Renewable Energy

Energy is an integral part of human activities, such as electricity. It held an important role during the industrialization revolution and still prevails to date (Ahuja & Tatsutani, 2009). Electricity generation is increasing due to increasing demand and fossil fuel as the primary source of electricity in the last 46 years (IEA, 2021). Unfortunately, fossil fuel is limited available in nature. Regardless, the remaining deposit is adequate for the next 120 years (Kakaras et al., 2012), sustainable development and climate change issues urge reducing fossil fuel use and utilizing renewable energy (RE) instead (Owusu & Asumadu-Sarkodie, 2016; Welsby et al., 2021).

Simultaneously, Fossil fuel usage possibly harms the environment, human health, and even future generations (Annamalai et al., 2018; Berenshtein et al., 2019; Carlson & Adriano, 1993; Edenhofer et al., 2011; Hansen et al., 2013; Lubchenco et al., 2012; Mishra & Das, 2017; Reuscher et al., 2020). Therefore, the government eagerly regulates from production to waste management stages, even dependence on fossil fuel (Aien & Mahdavi, 2020). RE sources like wind, water, and solar are promising to combat climate change and ensure energy sustainability (Kumar & Majid, 2020; Moriarty & Honnery, 2016). They are considerably cleaner than fossil fuels (Jain, 2019). IEA has recorded that RE utilization in electricity generation has increased by 10% in the last 46 years (IEA, 2021).

24.2.2 Photovoltaic Energy

The isolated and remote communities are often facing energy deficiency, mainly electricity (Zomers, 2003). PV technology is advancing (Durganjali et al., 2020; Goetzberger et al., 2002) and empirically resolve unelectrified communities and provide quality of life improvement (Cravioto et al., 2020). The type of off-grid PV can be installed anywhere. Installed PV is increasing steadily (IEA, 2021) and is predicted to be the largest installed power capacity (IRENA, 2019). PV has the potential to meet electricity demand in Indonesia (Silalahi et al., 2021). In 2019, the installed PV capacity reached 135 MW (Dewan Energi Nasional, 2020). Individual power producers (IPPs) produce more power than state- and private-owned electricity companies combined (Center for Data and Information Technology on Energy Mineral Resources, 2021).

Despite the bright future, adopting and installing PV have numerous challenges and obstacles spanning from the individual level to global level. Policy emerges as the main obstacle in introducing PV to the community (Lazdins et al., 2021). From the community perspective as users, solar PV is considered a high-technology energy generation and maintenance complexity (Alrashoud & Tokimatsu, 2019). Another increasing issue, scholars emphasized PV panels waste (Chowdhury et al., 2020).

24.2.3 Innovation

Innovation is a newness that results from research and development (R&D) activities conducted by universities and/or R&D institutes that can be commercialized to market (see Balachandra et al. (2010); Nelson in Casadella (2018)). Innovation also results from engineering reverse or development of existing invention as developing countries do (Aminullah et al., 2018; Mani, 2002). Innovation is also a newness in a new place, though it is the old one in previous places (Rogers, 1995). Innovation has four types: product innovation, process innovation, organization innovation, and marketing innovation (OECD-Eurostat, 2005). All innovation types are possibly applied in business and public organizations (Gault, 2018; Yip & McKern, 2016). It is possible to have one or more of those innovation types.

24.2.4 Regional and Sectoral Innovation System

A system consists of complex actors with various motives and networks, tied by an institution pattern (Gault, 2018). An innovation system (IS) is a mechanism to analyze and understand the innovation process by which surrounding actors interact with and learn from each other to develop economic growth strategy at the regional

or national level or particular sector (Lundvall et al., 2009). There are four main characteristics of IS: (1) co-evolutionary practice of technology supply and demand side, (2) change of structure elements on socio-technical system, (3) historical events in a change process, (4) involvement of multiactors and their networks (Geels et al., 2004). Multiactors are academicians, businesses, governments, and communities (ABGC) (Carayannis et al., 2012; de Oliveira et al., 2017; Ivanova & Leydesdorff, 2014). Those characteristics develop conceptually into national innovation system (NIS), regional innovation system (RIS), sectoral innovation system (SIS), and technological innovation system (TIS) (Lundvall et al., 2009; Malerba & Mani, 2009; Schrempf et al., 2013).

RIS is localized-economy development through knowledge transfer and innovation learning in a region (Isaksen, 2001; Lim, 2006; OECD, 2010; Parto & Doloreux, 2004). It is defined as a network and its linkage of multilayer and complex ABGC actors in doing innovation activities such as generation of innovation, learning of science-technology, knowledge transfer, business activities, diffusion, and utilization of innovation (Chung, 2002). While SIS focuses on foundation, structure, organization, and innovation-production dynamics in particular sectors. The sector is a set of activities interlinked with emerging demand on specific product(s) and its knowledge. SIS consists of elements: (1) enterprises actors (focal point actor), (2) nonenterprises actors, (3) networks, (4) demand, (5) institutions, (6) knowledge base, (7) Main process and coevolution, (8) transboundary of local, national, and global level (Malerba & Mani, 2009).

RIS and SIS have intersection elements; Isaksen (2001) states that RIS comprises interaction among actors (firms, universities, R&D institutes, finance agencies, intermediary agencies, business associations, training houses, etc.). Firms in industrial clusters are focal points to generate and diffuse knowledge. Malerba and Mani (2009) assert that SIS pays attention to innovation processes at particular sectors trespassing jurisdictions across regions and countries' boundaries, while jurisdictions bound NIS and RIS at the national and regional levels. Strupeit (2017) reveals that SIS evolves swiftly in dynamic landscape of market, policy, and technology. According to Chung (2002), RIS can promote to create SIS effectively. Moreover, the SIS helps create RIS that focuses on specific industry development.

24.2.5 Network Governance

The concept of network governance (NG) is often interchanged with governance networks. Both have something in common: they emphasize the interdependence of autonomous actors in realizing public goals (Marsh, 1998; Sørensen & Torfing, 2007; Torfing, 2007). Although there is an interdependent relationship, the position of each actor is equal. Even actor participation in the network is voluntary and free to leave the network (Sørensen & Torfing, 2007). Their interaction is carried out through negotiation and is relatively institutionalized (Torfing, 2007).

NG is considered an approach to understand political and administrative relationships of some actors, which in many cases are not determined by formal rule (Bogason & Zølner, 2007). However, actors try to develop both formal and informal regulations to create a more stable interaction (Sørensen & Torfing, 2007). Furthermore, Provan and Kenis (2007) formulated three forms of NG as mentioned in Table 24.1.

NG has a vital role in an innovation process (Khan, 2013; Zhang et al., 2019). This type of governance can bridge the interaction between disciplines (Guo et al., 2017; Laranja, 2012), by which each actor has a wide opportunity to enter the network. They can share information as well as do an interactive learning process leading to innovation (Bauknecht et al., 2020). The domain of innovation is not only in science and technology policies but also in other sector domains such as education, agriculture, health, etc. (Guo et al., 2017; Laranja, 2012). Interdisciplinary interactions also encourage sustainable innovation implementation (Rossignoli & Lionzo, 2018).

NG pays greater attention to the importance of community involvement in formulating and implementing an innovation (Laranja, 2012). The role of communities can enrich perception to formulate an innovation, provide sufficient resources to implement an innovation, and foster public trust among involved actors (Guo et al., 2017). An IS is run by ABGC actors by which they have respective interests and motives. Thus, the most appropriate form of NG will depend on the addressed issue and how ABGC actors interact.

24.2.6 Conceptual Framework

ABGC actors should be closely interlinked through cooperation or even competition in creating IS (Granstrand & Holgersson, 2020; Marshall & Parra, 2019). Therein, IS governance is required due to the complexity of involved actors (de Oliveira et al., 2017; Geels et al., 2004). NG is a fitted form by which actors are mutually interlinked, but each cannot directly influence other actors (Sørensen & Torfing, 2007). The institution exists to respond to actors' interlinkage, or it results

Table 24.1 Main predictors of the effectiveness of forms of network governance

Governance forms	Trust	Number of participants	Goal consensus	Need for network-level competencies
Participant NG	High density	Few	High	Low
Lead NG	low density, highly centralized	moderate number	moderately low	moderate
Administrative NG	Moderate density, monitored by members	Moderate to many	Moderately high	High

Source: Provan and Kenis (2007)

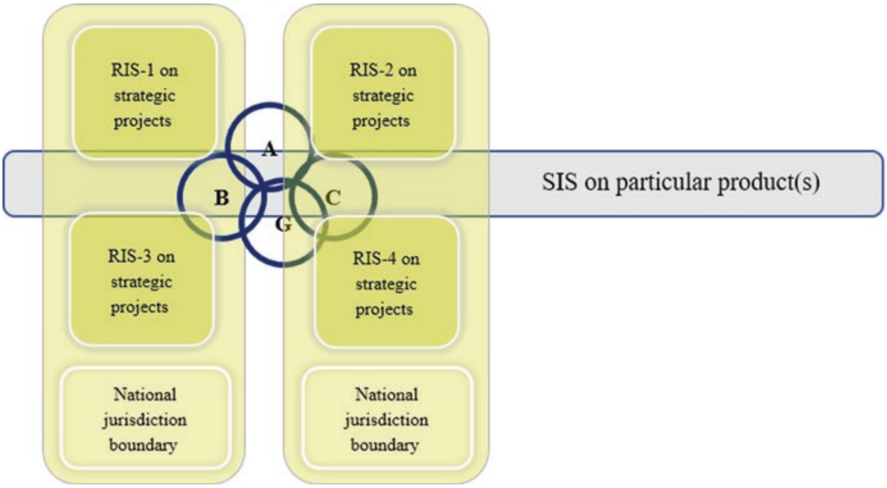


Fig. 24.1 NG on Development of RIS and SIS. (Source: Adopted from Schrempf et al., 2013; Ivanova & Leydesdorff, 2014; Strupeit, 2017)

from the socioeconomic change (Altenburg, 2009). This study focuses on NG perspective on RIS and SIS development with national jurisdiction as the boundary (Fig. 24.1).

24.3 Research Method

The study is qualitative research using multiple case studies. Creswell (2014) argues that qualitative study aims to reveal real phenomena, including scrutinizing an interrelation of involved actors in multiple cases. This study focuses on the actors and their relations to develop PLTS/SHS projects in Indonesia, including identifying sustainability issues of those projects. There are 14 PLTS projects and 1 SHS hamlet project as case studies dispersedly located in 8 regency governments within five province governments. The period of research was in 2014 year and 2018–2020 years sequentially (Table 24.2).

Collecting data was conducted through in-depth interviews with 51 key informants consisting of 24 villagers, including head villagers, 12 local government officers at the regency level, one local government officer at the province level, two Ministry of ESDM officers, three PV enterprises employees, three PLN employees, four academicians at universities and R&D institutes, one former PLN employee, and one former local government officer at regency level. The researchers observed the operation and maintenance of PLTS/SHS project in sites. Also, we collected relevant documents such as regulations, region planning agendas, PLN's electricity report, and Indonesian PV project inventory.

Table 24.2 List of visited PLTS/SHS project sites

No.	Regency – province	Survey site(s)	Research year
1	Bogor – West Java	1 PLTS unit	2014
2	East Belitung – Bangka Belitung	1 PLTS unit	2014
3	North Lombok – West Nusa-Tenggara	1 PLTS unit	2014
4	Alor – East Nusa-Tenggara	3 PLTS units	2018
5	Kupang – East Nusa-Tenggara	1 PLTS unit	2018
6	Pamekasan – East Java	2 PLTS units and 1 hamlet of SHS units	2018
7	West Sumba – East Nusa-Tenggara	3 PLTS units	2019
8	Blora – Central Java	2 PLTS units	2020

Data analysis was also carried out to produce a narrative about the relationship among actors to identify sustainability issues of PLTS/SHS projects and to propose IS design for PV development conceptually in Indonesia. According to Creswell (2014), qualitative method is helpful for researchers in capturing the complexity of the issue and in providing a contextual understanding. Those benefits will assist researchers in identifying the NG forms in the IS development of PLTS/SHS projects.

24.4 Result and Discussion

24.4.1 The Current Issues of PLTS/SHS Projects in Indonesia

PLTS/SHS projects are installed in rural areas, small and isolated islands without PLN's electricity grid PLN. This study explores 15 PLTS/SHS project sites categorized as following: electricity capacity, funding, PV builder, benefit for users, involved actors, and existing issues. The electricity capacity of PLTS units ranges from 10 KWp to 5 MW, only has the SHS unit has the capacity of 20 Watt. The 12 of 15 PV projects are funded by Ministry of ESDM, Ministry of village (one project), and PLN (two projects). Most of them are off-grid PLTS type, and the rests are on-grid PLTS connected to PLN's electricity grid. The SHS is automatically is off-grid type. Type of electricity grid and PV funding source are two main factors influencing PV project builders, involved actor roles, benefit for villagers/users, and issue to be addressed (see Asmara & Mitsufuji, 2018). Though, benefit for PLTS/SHS users is relatively similar on several sites (See on the appendix) (Fig. 24.2).

All PLTS/SHS projects (type I, II, III, IV) face similar problems: high cost of PV components and limited PV experts in Indonesia. Type I by which the very simplistic problems (see No.3 in the appendix). Type II is the simplistic problem (see No. 10 in the appendix). Type III is a complex problem (see No 2 in the appendix). Type

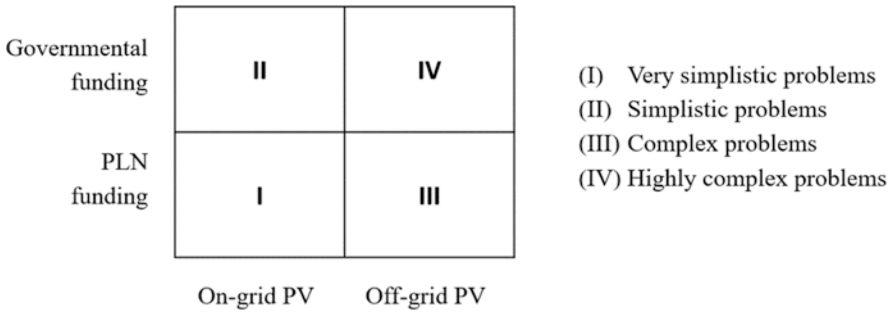


Fig. 24.2 Typology of sustainable PV problems in Indonesia

IV is the highly complex problem (see No 1, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15 in the appendix). The most complex problems are faced by Type IV such as limited electrical capacity to illuminate activities throughout the day, high technology, no maintenance due to low skill of local community, broken PV components after guarantee time over, high cost of transportation to site, high cost of PV components. Moreover, each region of PV projects has unique added issues as exemplified like (1) thievery of PV components, (2) reaving excessive electricity access surreptitiously occurred in and (3) the increasing households, the decreasing capacity of electricity.

In linear with global PV problems supposed to (Alrashoud & Tokimatsu, 2019), the main problems of PLTS/SHS projects are affordable PV technology availability and its experts in Indonesia. Secondly, each region where PLTS/SHS projects depend on socio-economy, local culture, geography, and demographycal attributes. Sectoral and regional domains are like "it takes two to tango" by which both are a fused concept used to address problems of PLTS/SHS projects in Indonesia. While PV is the sophisticated and highly updated technology requiring IS involving ABGC actors to develop it. Fusing SIS and RIS concepts to sustainable PLTS/SHS projects is feasibly proposed in Indonesia.

24.4.2 Discussion

Although both are feasible in the adjacent starting point, RIS and SIS can be created in different pathways because they have intersection parts (Chung, 2002). Co-evolutionary practice and historical events proposed by Geels et al. (2004) are two of the main elements of IS that underlay rationality of nearly time as a starting point in creating RIS and SIS adjacently and closely. RIS and SIS are interaction networks generated by ABGC actors (Malerba & Mani, 2009; Parto & Doloreux, 2004). Each of them is autonomous and independent, but they cooperatively address public problems according to their interests (Sørensen & Torfing, 2016).

Context of Indonesian ABGC actors can be defined as follows: (1) Academicians (A) are those who work as lecturers at universities and as researchers at R&D institutes, either public or private ownership. (2) Business (B) actors (state-owned/private) are main enterprises like PV-manufacturing firms and supporting enterprises like electricity firms, PLN, ingot/steel/aluminum firms, PV assembly, distributor, and installer firms, finance agencies, etc. The main goal of this actor is profit oriented. (3) Government agencies (G) are all agencies at the central and local Government of Indonesia. The central government like Ministry of ESDM, Ministry of Village, Ministry of Finance, etc. The local government like local agency of planning at province/municipality/regency level, local agency of energy at province level, etc. (4) Communities (C) are nongovernment organization(s) (NGOs), villagers/people, local partners, PV association(s), mass media, education institutes, and socio-culture-politics groups. Communities are commonly nonprofit organizations, but they also get external funding and nonfunding support to operate their daily activities (Fig. 24.3).

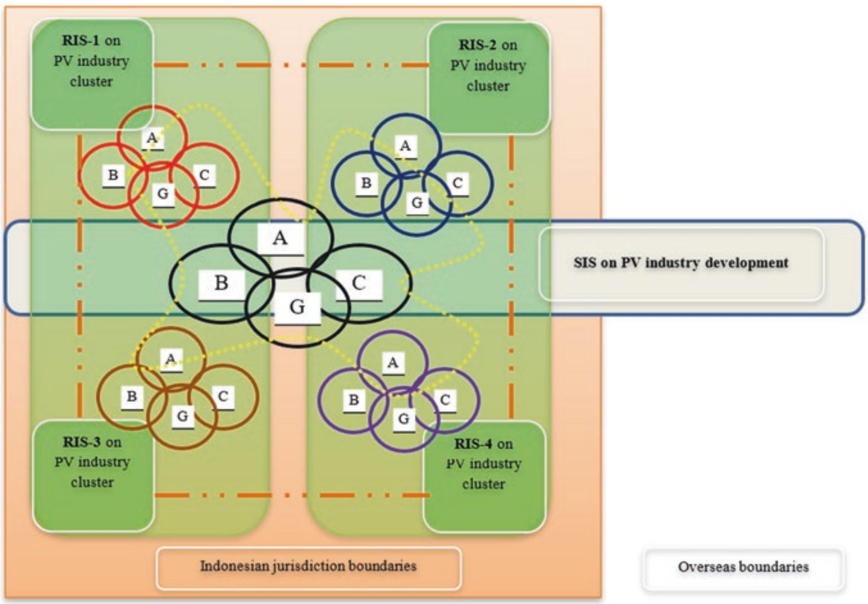


Fig. 24.3 Two-Sided RIS and SIS Frame in Developing Sustainable PV Projects in Indonesia. (Source: Analyzed research result with modification from Schrempf et al., 2013; Ivanova & Leydesdorff, 2014; Strupeit 2017)

▬ ▪ ▬ ▪ ▪: Interlinkage of RIS on PLTS/SHS projects and SIS on PV industry development

▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪: Interrelation among ABGC actors both in RIS and SIS on PLTS/SHS projects

24.4.3 Building RIS on PV Industry Cluster

Emergency of industrial cluster created by a nest of firms is not guaranteed to be an innovation cluster. The role of government is to initiate and facilitate creation of innovation cluster, because the government functions to provide terrain for industry cluster formally (see World Bank, 2010). Role of government is pivotal to transform from industry agglomeration to innovation cluster in a region, for instance, in building Hsinchu Science Industrial Park (HSIP) in Taiwan (Yang et al., 2009), and in the Suzhou Dushu Lake Science and Education Innovation District (SEID) in China (Sun et al., 2019). RIS also focuses on developing regionally knowledge-based economy (KBE). Therefore, PV industries are parts of a region's technology-based industries (TBIs).

Government Economic affairs excluding fiscal and monetary are decentralized to local government. Building KBE-like PV innovation cluster in a region is the duty of province and regency/municipality government. Province government agency responds and directs municipality/regency government agencies to make specific policies such as local regulations, middle-long term programs, multiyear budget allocation, incentives or levy allowance, and establishing public infrastructures to promote PV R&D activities and commercializing PV innovation to society/users. Besides providing terrain to build PV innovation cluster, another main task of local government agency is to address current issues of PLTS/SHS projects of users and business players. Really, local government agencies have limited capacity to do it because they do not have equal information and resources.

Academician Universities and R&D institutes are main institutes to generate new PV ideas, PV publications, PV technologies/prototypes, bring up PV R&D results to firms, and disseminate it to end users. In Indonesia, each region has local-standardized universities, most of them do not have the capacity to conduct national-global PV R&D activities. Even most of the region does not have PV R&D institutes. Academicians will find it easier to play their roles if government facilitates PV R&D activities.

Business Firms are motors of IS. Since government facilitates academicians and communities to do many PV activities, firms can benefit from this opportunity to absorb much information and knowledge and to upgrade PV technologies from supply-side (academician) and demand-side (communities). Besides, finance agencies are business actors playing roles to support PV finance schemes. The scheme can be soft loans with or without guarantee, equipment procurements, PV maintenance, or other finance agreement types. Academicians are feasible to get funding grants for doing PV R&D activities, but it is not directly delivered by finance agencies but by PV firms. Unfortunately, completed firms and financial institutions mentioned above are very rare in many regions.

Table 24.3 Interrelation of ABGC actors in building PV industry cluster

G Other actors	Facilitating PV R&D activities	Facilitating PV business activities	Facilitating PV community activities
A	Actively and Fully involved Actor (main actor)	Bringing up PV R&D results to firms (be commercialized)	Diffusing PV innovation to end-users
B	Source of PV innovation of supply-side	Actively and Fully involved Actor (main actor)	Source of PV innovation of demand-side
C	Cooperation in utilizing PV to local communities	Gaining PV operational grant-in-aid and other supporting facilities	Actively and Fully involved Actor (main actor)

Community In collaboration with academicians and the government, communities are involved as mentors in empowering villagers/PV users, as PV disseminators to many regions, and as silencer/reliever amidst PV conflict in communities. The government's facilitation to academicians, business, and communities will influence community activities in supporting PLTS/SHS projects. Unfortunately, very few local communities like NGOs and youth villagers have knowledge about PV technology and its maintenance (Table 24.3).

In the RIS frame, government facilitates PV activities for ABC actors. ABGC actors mutually collaborate to build multiyear PLTS/SHS projects according to their respective duty and responsibility, and each of them is profitable with these networks. Notwithstanding, each actor has limited capacity and resources, partial information/knowledge, and minimal public facilities to realize RIS on PV. Widening PV networks, cooperations, and collaborations with other ABGC actors at local and national level or even across countries is required. Building PV innovation cluster is not only the domain of regional ABGC actors, but intersection with national and global ABGC actors. Accordingly, building RIS on PV is accompanied by building SIS on PV.

24.4.4 Building SIS on PV Industry Development

SIS covers a paucity of RIS focused on general KBE development in a region. SIS focuses on a specific product leading to a specific focus on RIS. As supply-side, enterprises exist and grow with their networks across regions and nations to respond to market demands. Universities and R&D institutes collaborate with institutions across regions and nations to bring up R&D results to firms. They often utilize the opportunity of "open policy window" to come through existing policies to respond to market demands. Strupeit (2017) reveals that SIS evolves swiftly in dynamic landscape of market, policy, and technology. Multi-level perspective (MLP) proposed by Geels (2005, 2011) simplifies our understanding of how firms and

universities/R&D institutes at the niche level actively react to respond to market/communities at the landscape level by passing through governmental policies at the regime level.

Community Communities can trigger market demands at landscape level. They can stimulate firms and universities/R&D institutes to develop new products/technologies and stimulate central and local government agencies to respond to existing market demands to open policy window opportunities. Communities can stimulate PV development activities for ABG actors inside and outside regions/countries.

Academician PV R&D activities are stimulated by landscape condition; if communities need new PV technologies, universities/R&D institutes will react to bring up PV R&D results to firms at the niche level, though government regime in a region or country limits/hinders those activities. Indeed, R&D results are possible to be responded by other firms at different niches and by other government agencies at different regime levels that want to develop PV in its region/country.

Business Firms and universities/R&D institutes are at the niche level. Firms produce marketable PV products, while universities/R&D institutes generate latest PV technologies. Landscape conditions also stimulate them; if communities need new PV products, firms will react to meet market demands by involving universities/R&D institutes through government regimes in a region/country limit/hinder those activities. Rather, firms can involve universities/R&D institutes from another niche level to collaborate in producing new PV products. Firms have direct access from niche to landscape (market) utilizing the PV-opened policy windows across regions/countries. In this case, the role of finance agencies adjusts to existing conditions of firms, government policies, and market demands.

Government National and local government agencies, at the regime level, are intermediary actors for firms and universities/R&D institutes at the niche level and communities at the landscape level. Policy windows for developing PV will be easily opened when high pressure from landscape-level emerges and when firms and universities/R&D institutes prompt government to support PV activities from niche level due to high PV market demands. It is important for the government to facilitate ABC actors in developing PV projects and address its issues with many policy schemes like incentives, multiyear programs, allocated and specific budgets, community empowerment, etc. Often, strength of market demand is not responded to by government agencies in developing countries quickly. Consequently, there is a "policy vacuum" condition in temporary periods, and the PV policy window is largely opened until the government responds formally (Table 24.4).

Introducing PV to communities faces obstacles both at the individual level and global level, and one of them is hindering policy (Lazdins et al., 2021). In the SIS frame, ABGC are autonomous and independent actors mutually interlinked without negating their respective interests. Central and local government agencies are

Table 24.4 Inter-relation of ABGC actors in building PV industry development

C Other actors	Stimulating for doing PV R&D activities	Stimulating for manufacturing PV products	Stimulating for opening PV policies windows
A	Actively and fully involved actor (main actor)	Introducing new PV technologies to firms	Disseminating benefits of using PV to public
B	Responding PV market needs	Actively and fully involved actor (main actor)	Taking advantage of existing PV policies support
G	Supporting PV R&D activities	Supporting PV business process	Actively and fully involved actor (main actor)

catalysts to facilitate ABC interaction in developing PV inside and outside regions/countries. Academicians and businesses can respond to communities' demands through a closed policy window in a region/country. Those actors can collaborate with other ABGC actors across niche, regime, and landscape level. Edler et al. (2016) propose that innovation policy can be delivered by adopting the demand and supply side. Role of government is to bridge interests between ABGC actors in a region/country.

24.4.5 Network Governance Form in Building RIS and SIS for PV Sustainability

SIS and RIS focus on industry as key actors (Isaksen, 2001; Malerba & Mani, 2009). RIS is based on industrial region cluster, while SIS is based on industrial sector development. The involvement of ABGC actors is significant because multiple actors with different roles operate IS. NG is a lens to capture each actor's role and how they interact with each other. RIS can be initiated by central and/or local government in collaboration with firms to make PV industry cluster. Next step, the government can facilitate universities and R&D institutes to support those firms in manufacturing PV technologies.

Communities play many roles, such as PV users, PV mentors, PV disseminators, and PV observers that can be formed by the government or emerge by themselves to respond to the PV market. Adjusting from Rhodes (2017), NG form on the government to firms and academician can be delivered through centralization by which government is the leading actor to initiate and facilitate PV innovation cluster. While, NG form on government to communities is decentralization form by which government is an equal partner with communities that mediates firms and academicians to be actively involved in PV innovation cluster.

Industry networks across regions/countries stimulate SIS to respond to national and global market demands. The decentralized NG fits with SIS. Firms will be a magnet of ABG actors. Academicians will support firms with R&D results, communities will be users and partners of firms in maintaining PV production scale.

While the government will facilitate and coordinate ABC actors with regulations, incentives, infrastructure, funding, etc.

The building design of RIS and SIS depends on how actors' networks are mutually interconnected. Provan and Kenis (2007) provide three forms of NG, namely, participant-governed network (Participant NG), lead organization-governed networks (Lead NG), and network administrative organization (Administrative NG), which are useful to delineate wholly various networks among involved actors. According to North (1990), organization is player(s), a bulk of many actors to achieve common goals.

Lead NG is apt to form to initiate RIS. Government intervention is critical to building PV innovation cluster, not PV agglomeration. After it is built, its sustainability is conducted through applying administrative NG. ABC actors are strongly involved in making sustainable to this cluster. The government is one contributor to making administrative rules tying them to promote PV innovation cluster. However, innovation cluster often leads to conflict (Noteboom, 2006), so participant NG is fitted to solve conflicts, and the role of government is as a mediator for ABC actors in addressing conflict. It needs participative discussion action, not coercive government action.

Context of SIS, firms are the main actors, while ACG actors are supporting actors. Participant NG is required to initiate SIS on PV. Formal and informal ties are required to keep all actors staying on the road. Accordingly, administrative NG is suitable in sustaining SIS on PV by which each actor can collaborate formally and informally. Like RIS, the practice of SIS also often emerges conflict among involved actors. The emergence of conflict on SIS can be approached through Lead NG. SIS is initiated with participatory NG and tied formally with administrative NG. It means that many rooms are opened to collaborate among actors since the initiating phase to the sustaining phase of SIS. Therefore, Lead NG through government role is required to mediate conflict among actors.

24.5 Conclusion

PLTS/SHS type and its funding sources are the main elements leading to complex issues of PLTS/SHS sustainability in Indonesia. There are four categories of PLTS/SHS problems: very simplistic problems, simplistic problems, complex problems, and highly complex problems. It means that the more on-grid PV funded by PLN, the more simplistic problems yielded. While the more off-grid PV financed by the government, the more complex problems yielded. RIS and SIS are suitable concepts to reduce those problems and sustain PLTS/SHS projects in Indonesia. Building RIS and SIS requires ABGC actors' collaboration by which each actor has their own resources and capacity to achieve their respective goals.

Suggestion for Indonesia, the ABGC collaboration in building PV sustainable projects can be started from RIS firstly through Lead NG that is subsequently formed SIS through participatory NG. Both can be formally tied through

administrative NG and sustained through participant NG. In the future, the Government of Indonesia should pay more attention to creating national PV market by stimulating academicians and businesses to collaborate in yielding new PV technologies, because RIS and SIS exist due to cooperation and competition across regions/countries. Future studies should address more detailed RIS and SIS elements of PV industry cluster(s).

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References

Adityawan, E. (2010). *Studi Karakteristik Pencatutan Solar Cell Terhadap Kapasitas Sistem Penyimpanan Energi Baterai*. Universitas Indonesia.

Ahuja, D., & Tatsutani, M. (2009). Sustainable energy for developing countries. *SAPIENS*, *2*(1). http://journals.openedition.org/sapiens/823

Aien, M., & Mahdavi, O. (2020). On the way of policy making to reduce the reliance of fossil fuels: Case study of Iran. *Sustainability (Switzerland), 12*(24), 1–28. https://doi.org/10.3390/su122410606

Alrashoud, K., & Tokimatsu, K. (2019). Factors influencing social perception of residential solar photovoltaic systems in Saudi Arabia. *Sustainability (Switzerland), 11*(19). https://doi.org/10.3390/su11195259

Altenburg, T. (2009). Building inclusive innovation systems in developing countries: Challenges for IS research. In B.-Å. Lundvall, K. J. Joseph, C. Chaminade, & J. Vang (Eds.), *Handbook of innovation systems and developing countries*. Edward Elgar Publishing.

Aminullah, E., Fizzanty, T., & Soesanto, Q. M. B. (2018). Drivers of innovation without formal R&D: selected cases of Indonesian firms. *Journal of STI Policy and Management*, *3*(2), 119–136. https://doi.org/10.14203/STIPM.2017.130

Annamalai, K., Thanapal, S. S., & Ranjan, D. (2018). Ranking renewable and fossil fuels on global warming potential using respiratory quotient concept. *Journal of Combustion, 2018*, 1–16. https://doi.org/10.1155/2018/1270708

Asmara, A. Y. (2018). Development of the photovoltaic industry and its technology in Indonesia: A multilevel perspective. In *Sustainable future for human security* (pp. 61–78). Springer. https://doi.org/10.1007/978-981-10-5433-4_5

Asmara, A. Y., & Mitsufuji, T. (2017). Photovoltaic development from new order regime to reformation regime in Indonesia: Perspective of technological innovation system. *STI Policy and Management Journal, 2*(1), 69. https://doi.org/10.14203/STIPM.2017.52

Asmara, A. Y., & Mitsufuji, T. (2018). *Implementation of solar cell energy project in Pamekasan Regency – Indonesia*. Grand Renewable Energy 2018 Proceedings.

Balachandra, P., Kristle Nathan, H. S., & Reddy, B. S. (2010). Commercialization of sustainable energy technologies. *Renewable Energy, 35*(8), 1842–1851. https://doi.org/10.1016/j.renene.2009.12.020

Bauknecht, D., Andersen, A. D., & Dunne, K. T. (2020). Challenges for electricity network governance in whole system change: Insights from energy transition in Norway. *Environmental Innovation and Societal Transitions, 37*, 318–331. https://doi.org/10.1016/j.eist.2020.09.004

Berenshtein, I., O'Farrell, S., Perlin, N., Sanchirico, J. N., Murawski, S. A., Perruso, L., & Paris, C. B. (2019). Predicting the impact of future oil-spill closures on fishery-dependent communities – A spatially explicit approach. *ICES Journal of Marine Science*. https://doi.org/10.1093/icesjms/fsz138

Boedoyo, M. S. (2013). Potensi dan Peranan PLTS Sebagai Energi Alternatif Masa Depan di Indonesia. *Jurnal Sains Dan Teknologi Indonesia, 14*(2). https://doi.org/10.29122/jsti.v14i2.919

Bogason, P., & Zølner, M. (Eds.). (2007). *Methods in democratic network governance*. Palgrave Macmillan UK. https://doi.org/10.1057/9780230627468

Carayannis, E. G., Barth, T. D., & Campbell, D. F. (2012). The Quintuple Helix innovation model: Global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship, 1*(1), 2. https://doi.org/10.1186/2192-5372-1-2

Carlson, C. L., & Adriano, D. C. (1993). Environmental impacts of coal combustion residues. *Journal of Environmental Quality, 22*(2), 227–247. https://doi.org/10.2134/jeq1993.00472425002200020002x

Casadella, V. (2018). *Innovation systems in emerging economies: MINT – Mexico, Indonesia, Nigeria, Turkey* (1st ed.). Wiley-ISTE.

Center for Data and Information Technology on Energy Mineral Resources. (2021). *Handbook of energy & economy statistics of Indonesia*. https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2020.pdf

Chowdhury, M. S., Rahman, K. S., Chowdhury, T., Nuthammachot, N., Techato, K., Akhtaruzzaman, M., Tiong, S. K., Sopian, K., & Amin, N. (2020). An overview of solar photovoltaic panels' end-of-life material recycling. *Energy Strategy Reviews, 27*, 100431. https://doi.org/10.1016/j.esr.2019.100431

Chung, S. (2002). Building a national innovation system through regional innovation systems. *Technovation, 22*, 485–491.

Cravioto, J., Ohgaki, H., Che, H. S., Tan, C., Kobayashi, S., Toe, H., Long, B., Oudaya, E., Rahim, N. A., & Farzeneh, H. (2020). The effects of rural electrification on quality of life: A southeast Asian perspective. *Energies, 13*(10), 2410. https://doi.org/10.3390/en13102410

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE.

de Oliveira, L. S., Echeveste, M. E. S., Cortimiglia, M. N., & Goncalves, C. G. C. (2017). Analysis of determinants for open innovation implementation in regional innovation systems. *RAI Revista de Administração e Inovação, 14*, 119–129.

Dewan Energi Nasional. (2020). *Bauran Energi Nasional*. Online: https://www.den.go.id/index.php/publikasi/index/%0ABauranEnergi

Durganjali, C. S., Bethanabhotla, S., Kasina, S., & Radhika, D. S. (2020). Recent developments and future advancements in solar panels technology. *Journal of Physics: Conference Series, 1495*, 012018. https://doi.org/10.1088/1742-6596/1495/1/012018

Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., Zwickel, T., Eickemeier, P., & Hansen, G. (2011). In S. Schlomer & C. von Stechow (Eds.), *Renewable energy sources and climate change mitigation*. Cambridge University Press. https://doi.org/10.1017/CBO9781139151153

Edler, J., Gök, A., Cunningham, P., & Shapira, P. (2016). Introduction: Making Sense of innovation policy. In E. Jakob, C. Paul, G. Abdullah, & S. Philip (Eds.), *Handbook of innovation policy impact* (pp. 1–17).

Esmailzadeh, M., Noori, S., Nouralizadeh, H., & Bogers, M. L. A. M. (2020). Investigating macro factors affecting the technological innovation system (TIS): A case study of Iran's photovoltaic TIS. *Energy Strategy Reviews, 32*, 100577. https://doi.org/10.1016/j.esr.2020.100577

Gault, F. (2018). Defining and measuring innovation in all sectors of the economy. *Research Policy, 47*, 617–622.

Geels, F. W. (2005). Process and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective. *Technological Forecasting and Social Change, 72*, 681–696.

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Journal of Environmental Innovation and Social Transactions, 1*, 24–40.

Geels, F. W., Elzen, B., & Green, K. (2004). General introduction: System innovation and transitions to sustainability. In B. Elzen, F. W. Geels, & K. Green (Eds.), *System innovation and the transition to sustainability* (pp. 1–16). Edward Elgar Publishing. https://doi.org/10.4337/9781845423421.00010

Goetzberger, A., Luther, J., & Willeke, G. (2002). Solar cells: past, present, future. *Solar Energy Materials and Solar Cells, 74*(1–4), 1–11. https://doi.org/10.1016/S0927-0248(02)00042-9

Granstrand, O., & Holgersson, M. (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation, 90–91*, 102098. https://doi.org/10.1016/j.technovation.2019.102098

Guo, T., Dong, J., Ren, X., & Huang, Y. (2017). The core enterprise network competence, network characteristics and the innovation network governance performance – From Chinese microcosmic evidence. *EURASIA Journal of Mathematics, Science and Technology Education, 13*(12). https://doi.org/10.12973/ejmste/77924

Halimatussadiah, A., Siregar, A. A., & Maulia, R. F. (2020). *Unlocking renewable energy potential in Indonesia: Assessment on project viability* (No. 052; LPEM-FEB UI working paper). https://www.lpem.org/wp-content/uploads/2020/07/WP-LPEM-052-Unlocking_Renewable_Energy_Potential_in_Indonesia.pdf

Hamdi, E. (2019). *Indonesia's solar policies designed to fail?* Institute for Energy Economics and Financial Analysis. https://ieefa.org/wp-content/uploads/2019/02/Indonesias-Solar-Policies_February-2019.pdf

Hansen, J., Kharecha, P., Sato, M., Masson-Delmotte, V., Ackerman, F., Beerling, D. J., Hearty, P. J., Hoegh-Guldberg, O., Hsu, S.-L., Parmesan, C., Rockstrom, J., Rohling, E. J., Sachs, J., Smith, P., Steffen, K., Van Susteren, L., von Schuckmann, K., & Zachos, J. C. (2013). Assessing "dangerous climate change": Required reduction of carbon emissions to protect young people, future generations and nature. *PLoS One, 8*(12), e81648. https://doi.org/10.1371/journal.pone.0081648

Hanson, J. (2018). Established industries as foundations for emerging technological innovation systems: The case of solar photovoltaics in Norway. *Environmental Innovation and Societal Transitions, 26*, 64–77. https://doi.org/10.1016/j.eist.2017.06.001

Hipp, A., & Binz, C. (2020). Firm survival in complex value chains and global innovation systems: Evidence from solar photovoltaics. *Research Policy, 49*(1), 103876. https://doi.org/10.1016/j.respol.2019.103876

IEA. (2021). *Key world energy statistics 2021*. IEA. https://www.iea.org/reports/key-world-energy-statistics-2021

IRENA. (2019). *Future of solar photovoltaic: Deployment, investment, technology, grid integration and socio-economic aspects (A Global Energy Transformation: paper)*. International Renewable Energy Agency.

Isaksen, A. (2001). Building regional innovation systems: Is endogenous industrial development possible in the global economy? *Canadian Journal of Regional Science, XXIV*(1), 101–120.

Ivanova, I. A., & Leydesdorff, L. (2014). Rotational symmetry and the transformation of innovation systems in a Triple Helix of university–industry–government relations. *Technological Forecasting and Social Change, 86*, 143–156. https://doi.org/10.1016/j.techfore.2013.08.022

Jain, V. (2019). Fossil fuels, GHG emissions and clean energy development: Asian giants in a comparative perspective. *Millennial Asia, 10*(1), 1–24. https://doi.org/10.1177/0976399619825687

Kakaras, E., Koumanakos, A. K., & Doukelis, A. (2012). Pressurized fluidized bed combustion (PFBC) combined cycle systems. In *Combined cycle systems for near-zero emission power generation* (pp. 220–233). Elsevier. https://doi.org/10.1533/9780857096180.220

Kebede, K. Y., & Mitsufuji, T. (2017). Technological innovation system building for diffusion of renewable energy technology: A case of solar PV systems in Ethiopia. *Technological Forecasting and Social Change, 114*, 242–253. https://doi.org/10.1016/j.techfore.2016.08.018

Khan, J. (2013). What role for network governance in urban low carbon transitions? *Journal of Cleaner Production, 50*, 133–139. https://doi.org/10.1016/j.jclepro.2012.11.045

Kieft, A., Harmsen, R., & Hekkert, M. P. (2017). Interactions between systemic problems in innovation systems: The case of energy-efficient houses in the Netherlands. *Environmental Innovation and Societal Transitions, 24*, 32–44. https://doi.org/10.1016/j.eist.2016.10.001

Kuhlmann, S., Shapira, P., & Smits, R. (2010). Introduction: A systemic perspective: The innovation policy dance. In E. S. Ruud, K. Stefan, & S. Philip (Eds.), *The theory and practice of innovation policy (An international research handbook)* (pp. 1–24). Edward Elgar Publishing, Inc.

Kumar, J. C. R., & Majid, M. A. (2020). Renewable energy for sustainable development in India: Current status, future prospects, challenges, employment, and investment opportunities. *Energy, Sustainability and Society, 10*(1), 2. https://doi.org/10.1186/s13705-019-0232-1

Laranja, M. (2012). Network governance of innovation policies: The technological plan in Portugal. *Science and Public Policy, 39*(5), 655–668. https://doi.org/10.1093/scipol/scs043

Lazdins, R., Mutule, A., & Zalostiba, D. (2021). PV energy communities – Challenges and barriers from a consumer perspective: A literature review. *Energies, 14*(16), 4873. https://doi.org/10.3390/en14164873

Lim, J. D. (2006). *Regional innovation system and regional development: Survey and a Korean case* (Working paper series volume 2006-05).

Lo, C.-C., Wang, C.-H., & Huang, C.-C. (2013). The national innovation system in the Taiwanese photovoltaic industry: A multiple stakeholder perspective. *Technological Forecasting and Social Change, 80*(5), 893–906. https://doi.org/10.1016/j.techfore.2012.08.016

Lubchenco, J., McNutt, M. K., Dreyfus, G., Murawski, S. A., Kennedy, D. M., Anastas, P. T., Chu, S., & Hunter, T. (2012). Science in support of the Deepwater Horizon response. *Proceedings of the National Academy of Sciences, 109*(50), 20212–20221. https://doi.org/10.1073/pnas.1204729109

Lundvall, B.-A., Vang, J., Joseph, K. J., & Chaminade, C. (2009). Innovation system research and developing countries. In B.-A. Lundvall, K. J. Joseph, C. Chaminade, & J. Vang (Eds.), *Handbook of innovation systems in developing countries. Building domestic capabilities in a global setting* (pp. 1–30). Edward Elgar Publishing.

Malerba, F., & Mani, S. (2009). Sectoral systems of innovation and production in developing countries: An introduction. In F. Malerba & S. Mani (Eds.), *Sectoral systems of innovation and production in developing countries: Actors, structure, and evolution* (pp. 3–24). Edward Elgar Publishing.

Mani, S. (2002). *Government, innovation, and technology policy*. Edward Elgar Publishing, Inc.

Marsh, D. (1998). The utility and future of policy network analysis. In D. Marsh (Ed.), *Comparing policy networks*. Open University Press.

Marshall, G., & Parra, Á. (2019). Innovation and competition: The role of the product market. *International Journal of Industrial Organization, 65*, 221–247.

Ministry of Energy and Mineral Resources. (2018). *Kementerian ESDM Akan Tuntaskan 100% Rasio Elektrifikasi di 2022*. SIARAN PERS NOMOR: 180.Pers/04/SJI/2020. https://www.esdm.go.id/id/media-center/arsip-berita/kementerian-esdm-akan-tuntaskan-100-rasio-elektrifikasi-di-2022-

Ministry of Energy and Mineral Resources. (2019). *Peluang Besar Kejar Target EBT Melalui Energi Surya*. https://ebtke.esdm.go.id/post/2019/09/26/2348/peluang.besar.kejar.target.ebt.melalui.energi.surya

Ministry of Finance. (2021). *Komitmen Indonesia Dalam Mengatasi Perubahan Iklim*. https://www.kemenkeu.go.id/publikasi/berita/komitmen-indonesia-dalam-mengatasi-dampak-perubahan-iklim/

Mishra, N., & Das, N. (2017). Coal mining and local environment: A study in talcher coalfield of India. *Air, Soil and Water Research, 10*, 117862211772891. https://doi.org/10.1177/1178622117728913

Moriarty, P., & Honnery, D. (2016). Can renewable energy power the future? *Energy Policy, 93*, 3–7. https://doi.org/10.1016/j.enpol.2016.02.051

Nooteboom, B. (2006). Innovation, learning and cluster dynamics. In B. Asheim, P. Cooke, & R. Martin (Eds.), *Clusters and regional development: Critical reflections and explorations* (pp. 137–163). Routledge.

Nordfors, D. (2004). The role of journalism in innovation systems. *Innovation Journalism, 1*(7), 1–18.

North, D. C. (1990). *Institution, institutional change and economic performance*. Cambridge University Press.

OECD. (2010). *Regional innovation strategies*. www.oecd.org/innovation/policyplatform

OECD-Eurostat. (2005). *Oslo manual: Guidelines for COLLECTING AND INTERPRETING INNOVATIOn Data*. OECD Publishing.

Owusu, P. A., & Asumadu-Sarkodie, S. (2016). A review of renewable energy sources, sustainability issues and climate change mitigation. *Cogent Engineering, 3*(1), 1167990. https://doi.org/10.1080/23311916.2016.1167990

Parto, S., & Doloreux, D. (2004). *Regional innovation systems: A critical synthesis* (UNU-INTECH Discussion Paper Series, Issues 2004–17). United Nations University – INTECH.

Peraturan Pemerintah No 79 Tahun 2014 tentang Kebijakan Energi Nasional *(Government Law No. 79/2014 about National Energy Policy)*. Retrieved from https://peraturan.bpk.go.id/Home/Details/5523/pp-no-79-tahun-2014 (in Indonesian).

Provan, K. G., & Kenis, P. (2007). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory, 18*(2), 229–252. https://doi.org/10.1093/jopart/mum015

Retnanestri, M. (2007). *The I3A framework – Enhancing the sustainability of off-grid photovoltaic energy service delivery in Indonesia*. University of New South Wales (UNSW): PhD thesis. OpenURL. http://unsworks.unsw.edu.au/fapi/datastream/unsworks:1598/SOURCE1?view=true

Retnanestri, M., Outhred, H., & Healy, S. (2003). *Off-grid photovoltaic applications in Indonesia: An analysis of preliminary fieldwork experience*. In ANZSES 2003 destination renewables conference, pp. 1–10.

Reuscher, M. G., Baguley, J. G., & Montagna, P. A. (2020). The expanded footprint of the Deepwater Horizon oil spill in the Gulf of Mexico deep-sea benthos. *PLoS One, 15*(6), e0235167. https://doi.org/10.1371/journal.pone.0235167

Rhodes, R. A. W. (2017). *Network governance and the differentiated polity* (Vol. 1). Oxford University Press. https://doi.org/10.1093/oso/9780198786108.001.0001

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). Free Press.

Rossignoli, F., & Lionzo, A. (2018). Network impact on business models for sustainability: Case study in the energy sector. *Journal of Cleaner Production, 182*, 694–704. https://doi.org/10.1016/j.jclepro.2018.02.015

Schrempf, B., Kaplan, D., & Schroeder, D. (2013). *National, regional, and sectoral systems of innovation – An overview* (Report for FP7 Project "Progress"). progressproject.eu.

Setiawan, S., Siahaan, S. H., Manalu, R., Pabeta, A. T., Asmara, A. Y., Alamsyah, P., & Maulana, Q. (2014). *Studi Model Bisnis Dan Kemampuan Teknologi Industri PLTS Menuju Kemandirian Energi* (No. 2015-01-01–08).

Shubbak, M. H. (2019). The technological system of production and innovation: The case of photovoltaic technology in China. *Research Policy, 48*(4), 993–1015. https://doi.org/10.1016/j.respol.2018.10.003

Silalahi, D. F., Blakers, A., Stocks, M., Lu, B., Cheng, C., & Hayes, L. (2021). Indonesia's vast solar energy potential. *Energies, 14*(17). https://doi.org/10.3390/en14175424

Sørensen, E., & Torfing, J. (Eds.). (2007). *Theories of democratic network governance*. Palgrave Macmillan UK. https://doi.org/10.1057/9780230625006

Sørensen, E., & Torfing, J. (2016). *Theories of democratic network governance* (pp. 1–342). https://doi.org/10.1057/9780230625006

Strupeit, L. (2017). An innovation system perspective on the drivers of soft cost reduction for photovoltaic deployment: The case of Germany. *Renewable and Sustainable Energy Reviews, 77*, 273–286. https://doi.org/10.1016/j.rser.2017.04.011

Sun, S. L., Zhang, Y., Cao, Y., Dong, J., & Cantwell, J. (2019). Enriching innovation ecosystems: The role of government in a University Science Park. *Global Transitions, 1*, 104–119.

Torfing, J. (2007). Introduction: Democratic network governance. In M. Marcussen & J. Torfing (Eds.), *Democratic network governance in Europe* (pp. 1–22). Palgrave Macmillan UK. https://doi.org/10.1057/9780230596283_1

Valkama, P., Stephen, J. B., & Ari-Veikko, A. (2013). Contexts and challenges of organizational innovation in public services. In V. Pekka, J. B. Stephen, & A. Ari-Veikko (Eds.), *Organizational innovation in public services forms and governance*. Palgrave Macmillan.

Welsby, D., Price, J., Pye, S., & Ekins, P. (2021). Unextractable fossil fuels in a 1.5 °C world. *Nature, 597*(7875), 230–234. https://doi.org/10.1038/s41586-021-03821-8

World Bank. (2010). *Innovation policy: A guide for developing countries*.

Yang, C.-H., Motohashi, K., & Chen, J.-R. (2009). Are new technology-based firms located on science parks really more innovative? Evidence from Taiwan. *Research Policy, 38*, 77–85.

Yip, G. S., & McKern, B. (2016). *China's next strategic advantage from imitation to innovation*. The Massachusetts Institute of Technology Press.

Zhang, J., Yan, Y., & Guan, J. (2019). Recombinant distance, network governance and recombinant innovation. *Technological Forecasting and Social Change, 143*, 260–272. https://doi.org/10.1016/j.techfore.2019.01.022

Zomers, A. (2003). The challenge of rural electrification. *Energy for Sustainable Development, 7*(1), 69–76. https://doi.org/10.1016/S0973-0826(08)60349-X

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Chapter 25
Conceptual Design of Sustainable Governance by VIDEL (Virtual Dashboard of Environmentally Logistics-Port-City): A Case Study of Jakarta and Tanjung-Priok Port

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Abstract The dimensions of the triple bottom-line approach to sustainable development contain inherent conflicting goals in implementation. In cases of urban development around the world, this is exemplary for settings in major port cities. Here, mostly economically oriented infrastructure requirements of the ports meet more comprehensive concerns of sustainable urban development. There are incoherent governance systems: Ports are often involved in higher-level national planning hierarchies, while urban development is predominantly locally controlled. This is also the case in Jakarta Megapolitan with Tanjung Priok Port, Indonesia, the most prominent and still expanding national seaport. The port expansion is also aimed to be a significant hub in one of the world's maritime axes, which refers to vast urban growth. However, the entire urban economic effects are uncertain, for example, concerning urban diseconomies of scale or rebound effects, such as traffic congestion,

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social segregation, conflicts, or the digital divide. Urbanization and the contemporary patterns of economic growth are drivers of environmental vulnerability of both parties. This study serves to overcome fragmented approaches by using a holistic, sustainable governance transition process for integrating urban and port-industry governance concepts. A novel online platform, VIDEL (Virtual Dashboard of Environmentally Logistics-Port-City), is designed as a smart system that engages all stakeholders. This platform binds the requirements and interests as well as harmonizing actors in the interactions of urban with port and industry to secure innovative and environmental-friendly way. It will become a digital control tower for sustainable governance system in a port-city.

Keywords VIDEL · Environmental governance · Information system · Urban-port-industry interaction · Port planning · Sustainable urban development

25.1 Introduction

Governance is the most important principle in the case of ports, which becomes a critical hub in a national infrastructure for an economy, contributing to the realization of trade and movement. At the same time, port management, operations, and development are capital rigorous, exploit massive public space, produce both negative and positive impacts to the environment, and engage many actors such as port authority, terminal operators, logistics providers, and government. On the other side, existence of a port in a city generates communication between land and maritime networks developing supporting activities and having a strong influence on the spatial organization of the outlying region (Ducruet, 2011).

Therefore, the essence of governance involving a port has two folds, where each has its own interest and agenda. In one side, a port that usually managed by central government is required to have a good collaboration with the local government in the development of port-city/urban governance. While a port plays an important role in global supply chain governance as it is a vital hub that links industries, logistics, and consumers in international networks (see Fig. 25.1).

Although the two folds of governance have different directions, however, they have a similarity in terms of interactions with physical environment. The interaction is reciprocal of each other, where the anthropogenic activities will make some impacts to the environment, while, in turn, dynamics of the environment will also bring several risks to the activities. Hence, a good environmental governance becomes a key element to the sustainability for both contexts of port-city as well as the global supply chain.

However, some opportunities as well as challenges would be raised if both kinds of governance should be combined at the same time and place, such as the case of Tanjung Priok Port in the Special Capital Region (DKI) of Jakarta. This is the

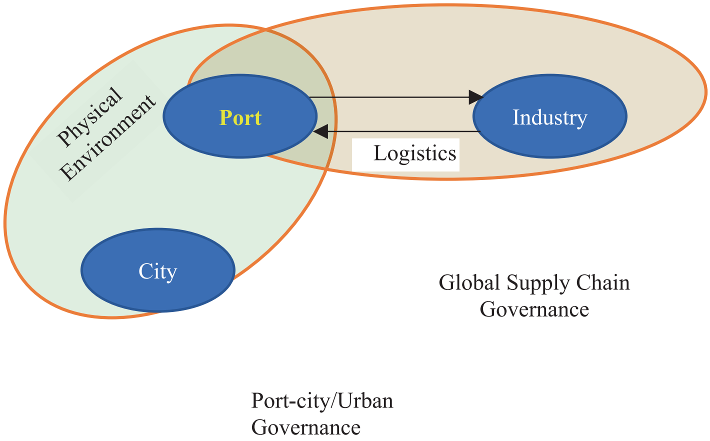


Fig. 25.1 Port and the two folds of governance, as well as their interactions with physical environment

largest and busiest port in Indonesia, with a container cargo productivity level reaching 6.8 million TEUs in 2019 by an average growth of 6% per year as it is a gateway to international trade and a stopover of domestic trade goods. As a result, the port is targeted to become a regional as well as national economic powerhouse, making symbiose mutualism with DKI Jakarta as a central of national politics and economy.

In parallel with the benefits of economic growth, Tanjung Priok Port also harms its urban zone. Based on the OECD synthesis report (Merk & Dang, 2013) of "The Competitiveness of Global Port-Cities" (2013), ports can also give rebound effects, mostly involving environmental issues, land use, and traffic congestion. Moreover, the status of Tanjung Priok Port as a national port also creates a level of operational and strategic complexity that is not in line with the development concept of the city itself.

The original reasons for port digitalization as specified by the European Transport Research Review are in traditional efficiency optimization and in enhancement of material (cargo) flow. As ports evolved from load and offload points to genuinely intermodal logistical service hubs, the importance of efficient information flow increased. In the case of Tanjung Priok Port, the proposed approach is the implementation of the revolutionary digital technology of "Super-Apps" to balance the development of the port and its related complex urban and environmental problems. This chapter, therefore, discusses these following questions: (1) Which digital technologies can help multistakeholder interests in port-urban communities with the objective of economic, social, and environmental sustainability? (2) What transition process binds the requirements and interests of the port, urban, and industrial areas? (3) What are enabling factors, elements, benefits, and challenges of creating smart sustainable governance in the interactions of port with urban and industry? (4). What is the framework and system design, which can encompass the port and city "Super-Apps" concept?

25.2 Literature Review

25.2.1 Interaction Between City and Port

A port is a center in the logistic field since it encourages collaboration among global supply chains, regional industry, and consumption markets. It is also entailing interactions among transports modes and supply chain actors, land and sea environment, and nodal point of facilities in the development supply chains (SC) port-city interaction. Some papers have addressed these issues and we have summarized them in Table 25.1.

25.2.2 Smart and Sustainable System

Smartness becomes an emerging tool in governance. Smart governance allows technology-enabled cooperation among citizens (including business, public sectors, societies) as well as among port and local governments. E-Government and smart city concepts are very interesting to be implemented on the port to achieve a sustainable system. Based on this issue, we are trying to collect some related studies in Table 25.2.

Table 25.1 Port-city interaction paper highlight

No.	Author(s)	Port-city Interaction	environmental Concern	Introduce smart system	Economic or SC views	Connecting port to the industry
1	Notteboom (2020)	Yes	No	No	Yes	Yes
2	Douaioui et al. (2018)	Yes	Yes	Yes	Yes	Yes
3	D'Amico et al. (2021)	Yes	No	Yes	Yes	Yes
4	Debrie and Raimbault (2016)	Yes	No	No	Yes	Yes
5	Ducret and Lee (2006)	Yes	No	No	Yes	Yes
6	Merk and Dang (2013)	Yes	Yes	No	No	No

Table 25.2 Smart city, e-Gov, and sustainable development selected paper

No.	Author(s)	Port-city interaction	Smart city or e-Gov.	Sustainable development	Economic or SC views
1	Beškovnik and Bajec (2021)	Yes	Yes	Yes	Yes
2	Tomor et al. (2019)	No	Yes	Yes	Yes
3	(Ahvenniemi et al. (2017)	No	Yes	Yes	Yes
4	(Hadi and Nawafleh (2012)	No	Yes	Yes	Yes
5	(Toli and Murtagh (2020)	No	Yes	Yes	Yes
6	(Haarstad (2016)	No	Yes	Yes	No
7	Yigitcanlar et al. (2018a, b)	No	Yes	Yes	Yes

25.2.3 *Aspects of the Framework of Smart and Sustainable Urban-Port Interaction*

Tables 25.1 and 25.2 present an overview of the aspects that have been studied in the context of sustainable urban port interactions. In Table 25.1, there are considerations of the environment (sustainability), the existence of smart system, discussions of the economy (or SC), and the connection of the Ports to industry. Meanwhile, Table 25.2 reviews how the basic things will be applied to urban-port interactions, for example, smart cities (or e-Gov), sustainable development, and economic growth. Table 25.1 concludes that only Douaiuoi et. al. (2018) considered all aspects, while other studies missed one or two aspects. Likewise, Table 25.2 shows that the overall aspects discussion was only carried out by Beškovnik and Bajec (2021). The following narrative provides an explanation of some of these aspects in the wider views.

Goals and Enabling Factors In principle, objectives of smart and sustainable port-cities contain sustainable development framework and digitalization. The sustainable development in port-cities highlights maritime aspects in considering environmental, social, and economic factors. While digitalization is an innovative opportunity for all related actors to develop coordinated network using mobile information and communication technological devices that provide the circulation of big data and information. To attain these goals, some enabling factors on the emerging smart and sustainable interactions in port-cities should exist, such as port-city ecosystem, internal organization, data and security, finance and funding, policy domain and trust, as well as digital technology. A port-city develops and implements policies and guidelines to state rules for sustainable and smart initiatives development (D'Amico et al., 2021) (Tomor et al., 2019).

Components, Domains, Dimensions Including Sustainability Domains of smart and sustainable interactions in port-cities governance comprise safety and security as well as mobility that require use of technology, environment and sustainability, economy, government, and community (D'Amico et al., 2021). Furthermore, three organizational characteristics are crucial for such smart governance: (1) commitment of local government to participate in the collaboration, (2) responsiveness of the government, and (3) operational management of the port-city. Citizen participation offers helpful recommendations for government agencies to deliver better-informed policy decisions (Tomor et al., 2019).

On the other side, a smart port consists of two pillars that include interconnection of the overall port-logistics chain and port automation as a mixture of hardware, software, and mechanics. The domains entail of operation, safety-security, sustainability, and energy (Douaioui et al., 2018) (Makkawan & Muangpan, 2021) (Sekhar, 2015). This paradigm offers a green port concept for implementation of sustainability dimension of port governance. The greening of port management is implemented through green initiatives and organized actions in a broader port community. In international context, there are some initiatives related to the green or sustainability of ports such as Ecoport of the European Sea Ports Organization (ESPO) since 2011 (Wooldridg, 2021), World Ports Sustainability Program (WPSPS, 2020), and Smart Port Index (SPI; Molavi et al., 2019).

Benefits Development of smart governance offers some benefits for both government and business in general, where effectiveness and efficiency become keys for all the aspects (D'Amico et al., 2021). It enables to provide a necessary foundation for both e-commerce services and e-government, for example, government could purchase services provided by private companies/consumers (Hadi & Nawafleh, 2012). In procurement, the online system of both public and private sectors influences e-commerce transactions (Blakeley & Matsuura, 2001). As regulator, the government provides a legal validity recognition for transactions, signatures, as well as appropriate safeguards that relates to trust in e-government (Myeong et al., 2014). Government enables to provide expenditures on e-government or e-commerce infrastructure that will support development of private businesses. The private sector will be benefited from electronic access to these services for their investment concerns and extending the communication infrastructure to the remotest parts of the country. Utilization of digitalization on existing processes in ports, logistic, and industry, as well as on their innovation efforts have positive impacts on port competitiveness and customer satisfaction both in direct and indirect ways. (Hadi & Nawafleh, 2012) (Lee et al., 2015).

25.3 Current Conditions in Port-City of Jakarta-Tanjung Priok Community

25.3.1 Area of Study: Relation Port, City, and Industry

Tanjung Priok Port is Indonesia's most significant port, along with the position of Tanjung Priok port as a global supply chain connectivity gateway and a center for cargo integration from several hinterland locations in Indonesia, the fact is that this port is located in the waterfront area of Jakarta. In the concept of port-city, the port of Tanjung Priok and the city of Jakarta form a function of intermediacy for cargo trajectory and centrality for human activity (Ducret & Lee, 2006). The term of port-city can be assigned to cities in coastal areas that have direct access to ports and have land that overlaps between urban administrative areas and port areas.

Moreover, the relationship between ports and industry is closely associated, where industry requires ports as an intermediary point of cargo transshipments. The port is equal to a logistics service provider node; there are goods handling services, consolidation and storage of goods, freight forwarding, bonded areas (customs), and a gathering point for various modes of transportation of goods. The utilization of ports for industrial needs opens up trade access more broadly; this creates a global supply chain, where the trajectory of cargo in the form of raw materials (commodities) and finished goods can occur between countries. In addition, the port itself needs an industrial area as a massive cargo turnover generator to continue producing a positive impact on the port's growth.

The existence of city, port, and industry has a relationship with the port-city community in the research conducted. As explained in the previous paragraph, the city and the port are two separate parts but share the same land, raising the complexity of each system's governance. The concept of port-city management shows the opportunity to establish mutual fulfillment of needs; the two divided systems will be used as a single management point of view. However, the single point of view creation of the port-city community at the same time does not eliminate the fact that industrial areas are another system that needs attention. Figure 25.2 shows the research area using the port-city community concept to reconcile interests between Jakarta and Tanjung Priok Port stakeholders. The figure explains that Tanjung Priok port has several domestic and international cargo terminals for O/D (Origin/Destination) nodes of cargo trajectory. The O/D nodes can be described as an industry (logistics user) that produces material and finished goods; it can also be interpreted as an industry (logistics user) that requires material and finished goods. At the same time, transshipment points likewise Dry Port, other Port, and Logistics Depot can also be included as O/D nodes. In more detail, the picture also shows the flow of cargo that can access inner-city lanes and toll roads within the corridor of Jakarta's urban areas by several hinterlands and transshipment points. It can be underlined that the case study of the Jakarta-Tanjung Priok port-city community has close ties among port, cities, and industries.

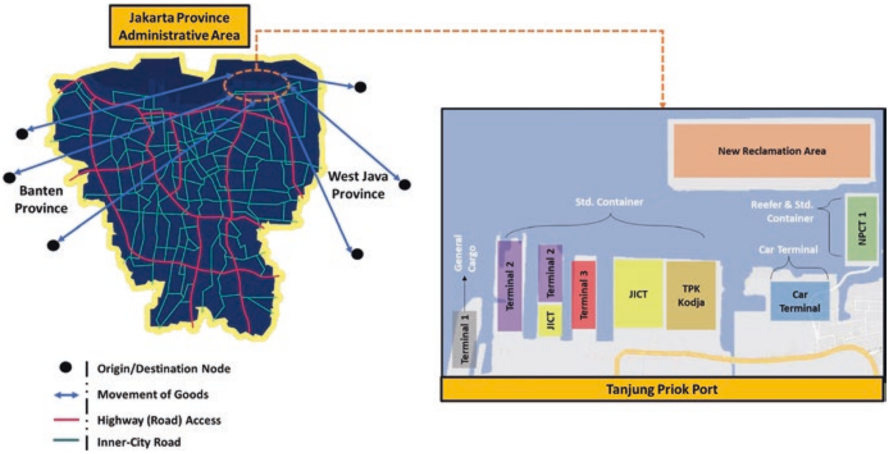


Fig. 25.2 Area of study

25.3.2 Gap Analysis on Smart Environmental Governance

In the development of smart governance in the urban network, the Jakarta Provincial Government has set a Super-Apps named JAKI (Jakarta Kini). The development of smart governance called JAKI has the concept of making Jakarta a smart city through six missions. This mission is derived from the expectations of the SDGs, so the city of Jakarta has initiated sustainability through JAKI. In JAKI, cocreation is created from a living lab agenda that invites the surrounding community to collaborate with the Jakarta government to carry out urban development.

Unfortunately, Jakarta and the Tanjung Priok port area have not yet initiated joint efforts to realize Jakarta as a comprehensive urban area, because they do not empower port stakeholders as a joint development. However, there are several groups of stakeholders who contribute to the development of digitalization governance on ports, logistics, and industry (see Table 25.3).

Those various stakeholder groups will send requests to decide or solve some problems on their fields (see Fig. 25.3). The advisory panel will guide the VIDEL development and implementation, while setting the system frames, defining the problems to be solved, gathering the requests of various stakeholder groups, translating them into solving algorithms, and then coming up with synchronically adjusting recommendations to dynamically changing conditions (such as new physical logistics infrastructure, emerging new technologies) providing an updated white paper and new tool sets each year. The decision scientists will be in charge of the development of a protocol for theory-based, evidence-based, and sustainability-oriented development of urban/logistics planning decision aids. Further, together with decision counselors and other actors, they will form guidelines for quality criteria of decision aids, being related to the content of a decision aid, to its development process, and to the evaluation of its effectiveness. The informaticians will develop and describe methods for identifying users' needs and for improving the

Table 25.3 Groups of stakeholders who contribute to the development of digitalization governance on ports, logistics, and industry

Stakeholder name	Group/type
Presidential staff office	Government nonstructural institutions
DKI Jakarta provincial Government (governor, major of North Jakarta, planning agency, Transport agency, logistics agency)	Governmental Policy makers
The Indonesia coordinating Ministry for Maritime Affairs and Investment	Governmental Policy makers
The Indonesia Ministry of Transport (directorate general of sea transportation)	Governmental Policy makers
Shipping agents Container terminals Non container terminals PT. Jakarta international container PT. Graha Segara PT. Bogasari flour Mills PT. PBM Adipurusa PT. Mustika Alam Lestari	Commercials & industrial partners
Tanjung Priok Main port authority office	Port authority
PT. IPC Tanjung Priok	Port operator
The Indonesian logistic and forwarder association (ILFA)	Logistic service providers
PT Telkom Indonesia – Jakarta	Technology provider (informatics dept.)
Institute of Supply Chain and Logistics Indonesia (ISLI)	Academia
Vulnerable groups	Beneficiaries
Terminal users in North Jakarta	Beneficiaries
General public	Beneficiaries

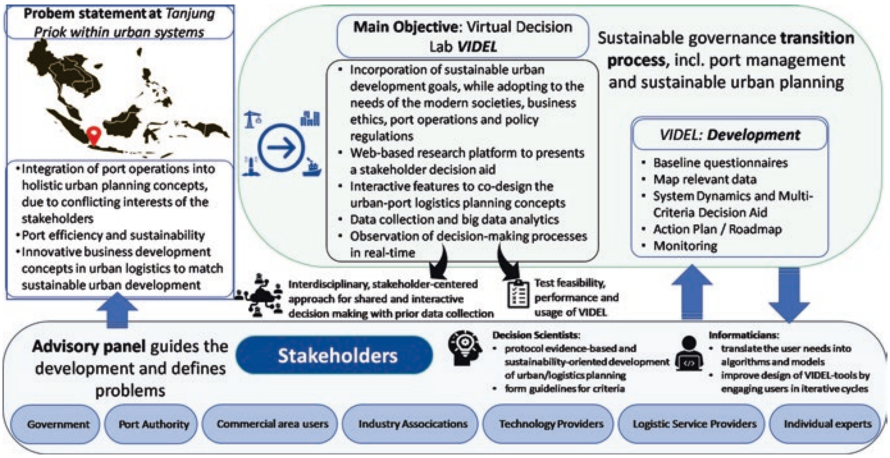


Fig. 25.3 The mechanism of stakeholders' contribution on the VIDEL

design of web-based tools by engaging users in rapid iterative cycles of design, evaluation, and redesign of these tools and features.

It is observed that a little of Jakarta's waterfront areas which the port and logistic buffer zone are included, do not share the modern city concept that JAKI is trying to realize. We found some facts that port and logistical buffers zone generate several issues for urban areas. Noise, water and air pollution, congestion, and flood are examples of the environmental problems generated by port's activities and logistics. In case of periodic flooding due to heavy rain and/or storm surge in the ocean, several cargo terminals in Tanjung Priok do not experience such hazards at all due to raising their surfaces. However, the flooding is paradoxically experienced in the back-end area of the port, including the route used for trucking mode in the trajectory of cargo in/out of the area and several container depots.

In developing smart governance for the logistics network, port stakeholders have tried to improve services by developing digital-based services. Digital services that have been carried out, such as Digital Container Freight Station for ordering and payment processes, Automated Gate System is assisting in the identification process of cargo trucks in and out, Automated Vessel Traffic and Vessel Management for supervising ship turnaround time traffic condition, also Automated Tally System for measuring container weight and reporting to charge holder. The services digitalization provides transparency of the port activity process for the port service users. The integration of logistics activities also complements digitizing and automating the activity system at the port, through the subsidiary PT. ILCS (Perseroan Terbatas Integrasi Logistik Cipta Solusi) develops integrated supply chain services via Web-Apps based technology. However, their approaches didn't touch the environmental side yet.

Jakarta has experienced slow political actions amid the complexity of context and policy responses in mitigating the hazard. The situation suggests the importance of considering sustainable governance, for example, coastal transformations anticipating urban building densification, land use policy, forced relocation, land reclamation, and the complexity of upscaling modern real estate development. On top of that, land subsidence is the main factor that will threaten the stability of the land area of DKI Jakarta, which is located near the sea waters of Jakarta Bay. The threat is predicted to sink several areas in North Jakarta (see Fig. 25.4).

25.4 Results and Discussions

25.4.1 Framework

Port domination can secure complete logistics services into the integrated treatment of physical and nonphysical goods distribution. Multiple objectives occur as port can be seen as an intermodal connector, resulting in the growth of potential business

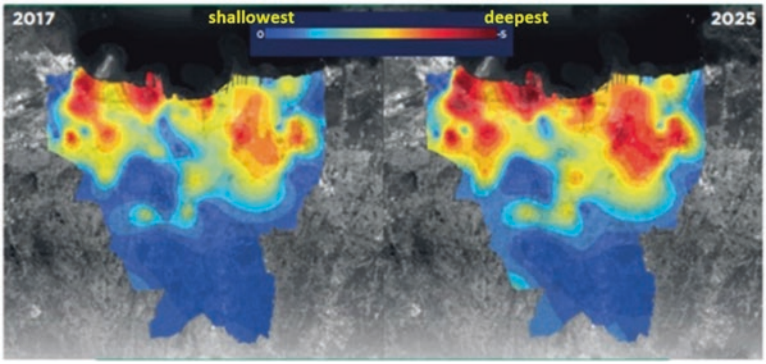


Fig. 25.4 Land subsidence projection map (2017 and 2025) in North Jakarta (Pemprov DKI Jakarta, 2019)

of the supply chain services sector. Furthermore, the position of port, which encompasses many supply chain businesses, could generate impact at the national, regional, and local levels. Nowadays, the new generation port has sophisticated technology to enhance its operational activities and to monitor environmental aspects. Port as a logistics node must contribute more significantly to eco-control performance to minimize environmental impact because of its dense operational activities. Air pollution, water pollution, untreated water, and waste disposal are notable examples of the environmental impacts generated by port activities. The aspects that need to be considered in port development and construction are water quality, coastal hydrology, soil contamination, marine and coastal ecology, air quality, noise and vibration, waste management, and visual intrusion, including the sociocultural impacts such as relocation of communities.

A port's governance model significantly influences its environmental initiatives (Faulin et al., 2018; Munim & Schramm, 2018). Parties that are critical in the governance model are government authorities (at the ministerial level or other relevant policy actors), the entities responsible for the management and operation of the port, and the involved private actors offering services. Urban and port-industry interaction and coordination can be strengthened through sustainable port governance, at the same time considering a broader stakeholders' engagement to address environmental variables linked with port expansion agenda and daily activities. Specifically for Tanjung Priok Port, in order to integrate the different interests and organizations among entities involved in the sustainable port's governance, as well as to align the various supply chain actors, a system called VIDEL (Virtual Dashboard of Environmentally Logistics-Port-City) is designed by the authors to facilitate interactivity between DKI Jakarta Provincial Government as the urban element with key stakeholders in Port and Industry.

The VIDEL that we propose is currently still a concept that constructed as an open platform. It can be embedded with mini applications, where such functions as the main hub to stimulate interchangeable data flow (see Fig. 25.5). The platform

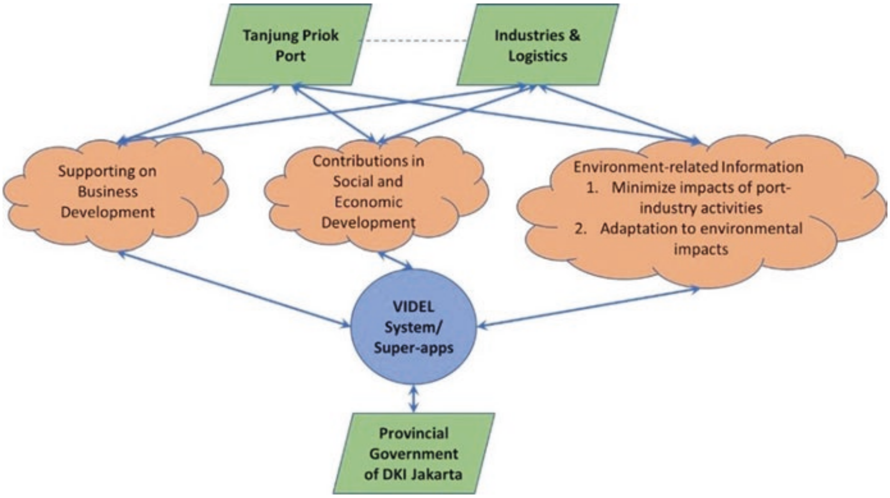


Fig. 25.5 Framework of Tanjung Priok Port-City–industry–environment interactions

creates the so-called "smart society" evolution, satisfying every actor in the stakeholder groups in terms of multiagent engagement. This concept will assure sustainability of the platform. In the implementation level, this platform will be managed by the Jakarta Provincial Government as their expansion of current Super-Apps named JAKI (see subchapter Gap Analysis on Smart Environmental Governance).

25.4.2 Context Diagram (System Design)

Context diagram (Fig. 25.6) sets the context and system constraints in a modeling. This includes relationships with entities outside the system itself, such as systems, organizational groups, and other external data stores in VIDEL.

The whole VIDEL system is controlled by VIDEL Main Controller and supported by Database system, Accounting system and Customer Service system and is in charge of 9 other subsystems: (1) Login Authentication System; (2) VIDEL Mobile App; (3) Payment Gateway; (4) E-Commerce System; (5) Decision Support System Module; (6) Environment Monitoring Module; (7) Urban Monitoring Module; (8) Port Operational Monitoring Module; and (9) Logistics Monitoring Module. VIDEL (Virtual Dashboard of Environmentally Logistics-Port-City) is designed to be a virtual ecosystem that facilitates an interactivity between Port – City – Industry. Further explanation about this system is provided at this link: https://link.untirta.ac.id/VIDELcomplete.

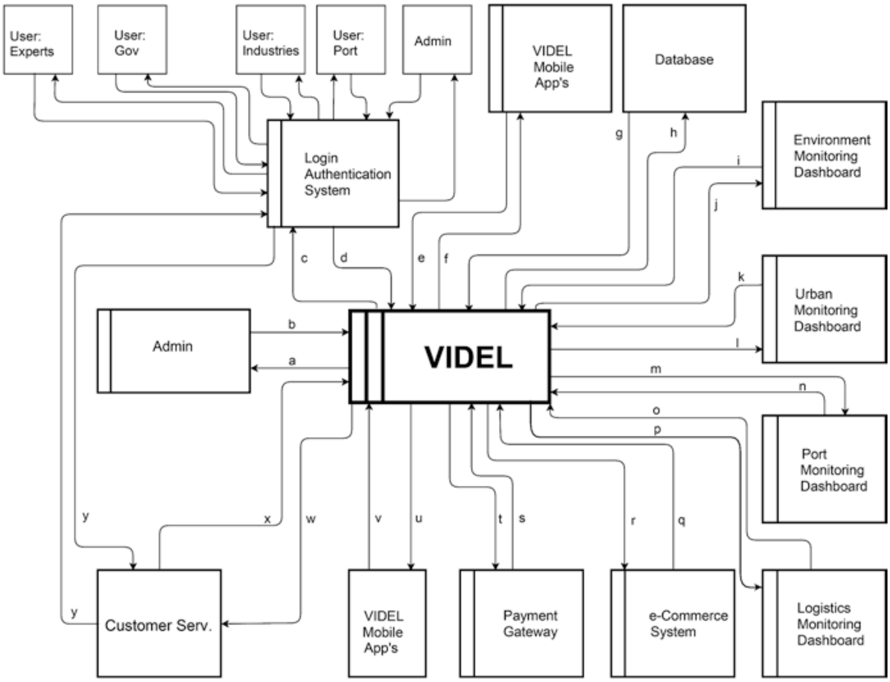


Fig. 25.6 Context Diagram of VIDEL

25.4.3 Transition Process

Transition is a needed action for VIDEL implementation. An advisory panel consisting of stakeholder groups' actors will be the key in guiding VIDEL development. The board will manage the interests of many stakeholders in order to align the directions of city and port development. Furthermore, they will be able to capture potential business models that evolve amidst the society's needs toward the development of digital platforms for businesses. The transition process is basically a synchronization of interests to find mutual goals in the context of changing conditions (such as new physical logistics infrastructure, emerging new technologies, fluctuate society demands, global environmental concerns) in the port-city community. It aims to provide an updated white paper and new tool-sets each year.

To convince stakeholders of the VIDEL reliability, the developer has to build a web-application-based platform with an interactive feature as a center vessel to encourage achievement of the primary goal of collaborative ecosystems. As the main body of the platform, monitoring dashboard as a tool to aid stakeholders to make informed decisions is equipped with data collection and stocktaking analysis. This will play as the principal interactive feature to attract more engagement in the stakeholders' groups, leading to "super apps" progression to secure mini-platforms development, which is the answer to future potential businesses. To guarantee the

success of the system, managing different scenarios and developing an integrative urban-logistics plan are high, variable, and useful. The transition process, which requires involvement of multiple actors and resources, will consist of the following activities respectively: (1) Synchronization; (2) Questionnaire; (3) Mapping; (4) System Dynamics Method; (5) Action Plan; (6) Advisory Board Monitoring. Detailed explanation of this process can be found on this link: https://link.untirta.ac.id/VIDELtransition.

25.4.4 Implementation Strategy

Development Phase Implementation of the VIDEL consists of the stage of application and testing for the system based on the results. Therefore, we propose the following phases of development: (1) Preliminary & Data Integration; (2) Development of Algorithms & Models (experimentation). (3) Software process/platform development (prototyping), (4) Stakeholders' feedback: (prototype testing), (5) Sustainability of the VIDEL; (6) Capacity Building/Training; (7) Finalization. Click this link for detailed description about these phases: https://link.untirta.ac.id/VIDELdev.

Interoperability Super app system is developed with technology that depends on various vendors, all of which are closed technologies. Many of the applications inside the super app are developed without using a database system (RDBMS/Relational Database Management System), which makes it very difficult to integrate with other systems.

The ability of a system or product to cooperate with another system or product is called interoperability, where one application can communicate with other applications. Super app also needs interoperability, because one information system is interrelated with other information systems even though the system is built with different platforms and databases. All applications and information islands that exist throughout the super app are assets that must be considered together to become an integrated system so that it can improve the quality of services delivered to users in the long term.

Security Super app is attractive to users because of its ability to provide various services without installing many applications, thus bringing convenience to their daily lives. However, one concern that comes with all this efficiency and comfort is data privacy. A super app collects personal data and financial accounts in the provision of its various services where those valuable and valuable data can be misused.

All applications and services hosting data will always be vulnerable to cybercrime threats and attempts. The more "super" an app is, the more valuable its data will be. Millions of new users and more transactions mean more personal data is being collected. Therefore, it is essential to design a super app with an

application-centric security strategy to find and recognize unusual data traffic patterns amid increasing data traffic by automated bots. An effective bot mitigation strategy should classify and prioritize data traffic from bots versus human-generated data traffic based on their identity and reputation.

In addition, it is necessary to carry out threat intelligence activities that can be followed up to find out how much chance an application will be attacked and determine the company's priority response. Super app providers can ensure the security of applications and the data stored on them by installing a full-featured yet flexible web application firewall (WAF). Its goal is to reduce and block unwanted data traffic through capabilities such as proactive bot protection, headless browser detection, form, and field-level encryption, layer 7 DoS mitigation, input sanitization, and behavioral analysis. Bots have indeed changed our lives in cyberspace. Therefore, maintaining consumer data security must be a priority for super app providers so that their super apps can certainly continue to grow. Otherwise, it's not just customer data that's at risk. But also, the business and reputation of the super app provider itself.

25.4.5 Transformation Impacts

VIDEL will promote smart system of the port-city-industry interaction in an evidence-based, structured, and integrated manner. This program will also encourage sustainability through environmental governance framework. On the other hand, VIDEL will be an integrated system platform as an innovation that unites environmental-friendly industries, ports, and cities.

In the national and regional development, the VIDEL system is expected to mainly contribute to the achievements of three of the Indonesia's Sustainable Development Goals (SDGs). As a contribution to the Goal 9 or SDG 9. The smart system will foster innovation in developing resilient virtual infrastructure and promoting sustainable industrialization that is supported by the Tanjung-Priok Port. In other side, VIDEL will meet to the Goal 11 or SDG 11. The proposed system will encourage inclusiveness, resilience, and sustainability of the DKI Jakarta Province.

This system will also support the climate action of the 13th goal, which is backing the Indonesia's commitment to the Paris Agreement through the Nationally Determined Contribution (NDC), especially to keeping "1.5 degrees alive" because of the 26th UN Climate Change Conference in Glasgow. Some actions can be endorsed by the system, not only reducing GHG emission from the port-city-industry activities but also lowering risks of climate change impacts on the activities. Smartness of the system will also be developed to support an early warning system of some environmental hazards.

In other side, the smart system will also commit to other goals as it provides positive impacts on national and local economics (SDG 8 on Decent Work and Economic Growth), social and governance (SDG 16 on Peace, Justice, and Strong Institutions), as well as overall goals (SDG 17 on Partnerships for the Goals).

25.5 Conclusion

This chapter has explored smart and sustainable governance in the interactions of urban with port and industry. Concepts, enabling factors, elements or dimensions, benefits and challenges have been described in terms of development the framework and system design of VIDEL. Framework of Tanjung Priok Port – City – Industry – Environment Interactions has been constructed that employs a system design, which can encompass the port-city "Super-apps" concept. This system consists of (1) Main server VIDEL, (2) Mobile App's Server, (3) Payment Gateway, (4) E-Commerce System, (5) Decision Support System (DSS), (6) Environment Monitoring Module, (7) Urban Monitoring Module, (8) Port Operations Monitoring Module, (9) Logistics Monitoring Module.

The opportunity to initiate smart governance with a proenvironmental nuance is no longer just a utopia for the global community. Technological development based on digitalization open the access of multistakeholder interest reconciliation, using data integration and machine learning process to solidify the determination of global problems. Besides, the urge of collaborative design is well accepted in every community background. Incorporated the sophisticated technology development, cocreation management, and international concern of sustainability creates the possibility of balanced output (in economic, social, and environmental goals). This study shows super system governance, which contains issues of Port-City–Industry–Environment that can be applied to the Jakarta-Tanjung Priok port-city community. Port and city will become an urban-governance-chain to compile future integrated spatial initiatives. Moreover, port and industry also construct a logistics network establishing global supply agendas. VIDEL have a role as sustainable system that will be built using intelligent management based on Super-Apps. The involvement of all stakeholders in the Jakarta-Tanjung Priok community aims to produce a reliable digital ecosystem, where all actors in the industrial system, logistics service providers, and port operators can be part of the development of Super-Apps business features. Port Authority can be a collaborator in the development of environmental monitoring features.

VIDEL will help to answer such complex urban governance problems and underlying issues related to the city and port such as poverty, lack of capacity, diverse sociocultural contexts, inequality, and power asymmetry. Those problems will be addressed by the advisory panel of VIDEL and then translating them into solving algorithms and then coming up with synchronically adjusting recommendations to dynamically changing conditions (such as new physical logistics infrastructure, emerging new technologies) providing an updated white paper and new tool sets each year. The decision scientists will be in charge for the development of a protocol for theory-based, evidence-based, and sustainability-oriented development of urban/logistics planning decision aids. Further, together with decision counselors and other actors, they will form guidelines for quality criteria of decision aids, being

related to the content of a decision aid, to its development process, and to the evaluation of its effectiveness.

VIDEL is proposed as an interface that bridges the interaction between JAKI and existing smart-port applications. It is designed as a sustainability included smart-platform to facilitate interactions of urban with port and industry.

The following systematic development phases and activities are recommended for transition process: Synchronization; Questionnaire; Mapping; System Dynamics Method; Action Plan and Advisory Board Monitoring. We also complete the concept with some action plans: (1) Development Phase (Preliminary & Data Integration; Development of Algorithms & Models; Software process/platform; development (prototyping): Stakeholders' feedback: (prototype testing); Sustainability of the VIDEL; Capacity Building/Training; Finalization), (2) The attention to the Super-Apps interoperability and (3) Security.

In this disruption and VUCA (Volatility, Uncertainty, Complexity & Ambiguity) era, the VIDEL will become a "Super-apps" that binds interactions of urban, port and industry. It is also indispensable for national and regional development as well as contributes to the Sustainable Development Goals (SDGs). Major contributions are promoted by VIDEL to the goals related to the port-city–industry–environment interactions that are Industry, Innovation, and Infrastructure (9th), Sustainable Cities and Communities (11th), and Climate Action (13th). In addition, the smart system will also contribute to other goals, especially Decent Work and Economic Growth (8th), Peace, Justice, and Strong Institutions (16th), and Partnerships for the Goals (17th).

References

Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities, 60*, 234–245. https://doi.org/10.1016/j.cities.2016.09.009

Beškovnik, B., & Bajec, P. (2021). Strategies and approach for smart city–port ecosystems development supported by the internet of things. *Transport, 36(5), 433–443*. https://doi.org/10.3846/transport.2021.16194

Blakeley, C. J., & Matsuura, J. H. (2001). E-goverment: An engine to power e-commerce development. *The proceedings of the European conference on e-government*. Trinity College.

D'Amico, G., Depczyńska, K. S., Dembińska, I., & Ioppolo, G. (2021). Smart and sustainable logistics of port cities: A framework for comprehending enabling factors, domains and goals. *Sustainable Cities and Society, 69*. https://doi.org/10.1016/j.scs.2021.102801

Debrie, J., & Raimbault, N. (2016). The port–city relationships in two European inland ports: A geographical perspective on urban governance. *Cities, 50*, 180–187. https://doi.org/10.1016/j.cities.2015.10.004

Douaioui, K., Mouhsene, F., Mabrouki, C., & Semma, E. A. (2018). Smart port: Design and perspectives. In *4th international conference on logistics operations management*. https://doi.org/10.1109/gol.2018.8378099.

Ducret, C., & Lee, S.-W. (2006). Frontline soldiers of globalisation: Port–city evolution. *GeoJournal*, 107–122.

Ducruet, C. (2011). The port city in multidisciplinary analysis. *Collection of open chapters of books in transport research*. Vol. 2011, 122. URL: https://www.scipedia.com/public/Ducruet_2011a

Faulin, J., Grasman, S., Juan, A., & Hirsch, P. (2018). *Sustainable transportation and smart logistics: Decision-making models and solutions*. Elsevier.

Haarstad, H. (2016). Constructing the sustainable city: Examining the role of sustainability in the 'smart city' discourse. *Journal of Environmental Policy & Planning*, 423–437. https://doi.org/10.1080/1523908x.2016.1245610

Hadi, W., & Nawafleh, S. (2012). The role of e-business in the e-government services implementation. *International Journal of Academic Research Part A, 4*, 230–236. https://doi.org/10.7813/2075-4124.2012/4-6/A.31

Lee, S.-Y., Tongzon, J. L., & Kim, Y. (2015). Port e-transformation, customer satisfaction and competitiveness. *Maritime Policy & Management The Flagship Journal of International Shipping and Port Research, 43*(5), 630–643. https://doi.org/10.1080/03088839.2015.1

Makkawan, K., & Muangpan, T. (2021). A conceptual model of smart port performance and smart port indicators in Thailand. *Journal of International Logistics and Trade, 19*, 133–146. https://doi.org/10.24006/jilt.2021.19.3.133

Merk, O., Dang, T. (2013), The Effectiveness of Port-City Policies; a comparative approach, *OECD Regional Development Working Papers*, 2013/25.

Molavi, A., Lim, G. J., & Race, B. (2019). A framework for building a smart port and smart port index. *International Journal of Sustainable Transportation*, 1–13. https://doi.org/10.1080/15568318.2019.1610919

Munim, Z. H., & Schramm, H. J. (2018). The impacts of port infrastructure and and logistics performance on economic growth. *Journal of Shipping and Trade, 1*. https://doi.org/10.1186/s41072-018-0027-0

Myeong, S., Kwon, Y., & Seo, H. (2014). Sustainable e-governance: The relationship among trust, digital divide, and e-government. *Sustainability*, 6049–6069. https://doi.org/10.3390/su6096049

Notteboom, T. (2020). *Chapter 1.2 – Ports and maritime supply chains*. Retrieved from Port economics, management and policy a comprehensive analysis of the port industry. https://porteconomicsmanagement.org/pemp/contents/part1/ports-and-maritime-supply-chains/

Pemprov DKI Jakarta dan Sekretariat Jakarta Berketahanan. (2019). *Strategi Ketahanan Kota Jakarta*. Sekretariat Jakarta Berketahanan.

PT. Pelabuhan Indonesia II-IPC. (2019). *Annual report*. PT. IPC.

Sekhar, V. (2015). Evaluation of sustainability in e-governance projects. *IBMRD's Journal of Management and Research, 4*(1), 2277–7830. https://doi.org/10.17697/ibmrd/2015/v4i1/60338

Toli, A. M., & Murtagh, N. (2020). The concept of sustainability in smart city definition. *Frontiers in Built Environment, 6*, 77. https://doi.org/10.3389/fbuil.2020.00077

Tomor, Z., Meijer, A., Michels, A., & Geertman, S. (2019). Smart governance for sustainable cities: Findings from a systematic literature review. *Journal of Urban Technology, 26*, 3–27. https://doi.org/10.1080/10630732.2019.165117

Wooldridg, C. (2021). *The story of ecoports: Building a worldwide network for sharing experience in port environmental management*. Retrieved from www.ecoports.com

World Port Sustainability Program. (2020). *World ports sustainability report*. World Port Sustainability Program.

Yigitcanlar, T., Kamruzzaman, M., Buys, L., Ioppolo, G., Sabatini-Marques, J., Costa, E. M., & Yun, J. J. (2018a). Understanding 'smart cities': InAZtertwining development drivers with desired outcomes in a multidimensional framework. *Cities*. https://doi.org/10.1016/j.cities.2018.04.003

Yigitcanlar, T., Kamruzzaman, M., Foth, M., Sabatini, J., Costa, E. d., & Ioppol, G. (2018b). Can cities become smart without being sustainable? A systematic review of the literature. *Sustainable Cities and Society*. https://doi.org/10.1016/j.scs.2018.11.033

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